ENGINEERING EXHIBITS
IN SUPPORT OF COMMENTS OF
THE AM RADIO PRESERVATION ALLIANCE
IN MB DOCKET NO. 13-249

WWVA, Wheeling, West Virginia

JANUARY 2019

The attached engineering exhibits have been prepared on behalf of the AM Radio Preservation Alliance (AMRPA) to document the impact on AM radio service during nighttime, critical hours and daytime operations, respectively, if certain changes to the AM protection rules currently enforced by the Federal Communication Commission (FCC), under consideration in MB Docket No. 13-249, were adopted.[1] These exhibits clearly validate that there would be minimal theoretical gains in radio service provided by other AM stations at the expense of new interference to vastly more populations currently reached by established Class A AM radio service.

In this set of engineering exhibits, interference and coverage studies were conducted analyzing Class A AM Station WWVA, Wheeling, West Virginia, FCC Facility ID No. 44046, in regard to its nighttime (Figures 1-N through 11-N), critical hours (Figures 1.1-C through 2.3-C) and daytime operations (Figures 1-D through 4-D), applying the FCC's reduced protection requirements to Class A AM stations as proposed in the *SFNPRM*.[2]

As detailed further below, Figure 1-N documents the negative impact on the studied Class A AM station's nighttime signal from nearby non-Class A AM stations adding nighttime coverage assuming the *SFNPRM*'s Alternative 1 for nighttime hours protection to Class A AM stations (protection of 0.5 mV/m groundwave contour) was adopted, while Figures 2-N through 11-N show the theoretical additional service if neighboring non-Class A AM stations were to add nighttime coverage under Nighttime

[1] *See Revitalization of the AM Radio Service*, Second Further Notice of Proposed Rulemaking, FCC 18-139, MB Docket No. 13-249 (rel. Oct. 5, 2018) ("*SFNPRM*").

[2] These interference studies were conducted using computer software V-Soft AMpro2's incoming interference study program, combining interfering signal strength using the RSS methodology with a 50% minimum level for inclusion and a buffer grid size of 500x500.

Alternative 1.[3] Following these figures are contour maps (prepared by iHeartMedia's engineering staff) mapping these non-Class A AM station's theoretical nighttime AM gain areas in comparison with such station's licensed or permitted FM translator service area (60 dBu contour), where applicable,[4] along with a chart summarizing the actual FM translator population served in contrast to the theoretical nighttime AM gains coming at the expense of more interference on the AM band.

Figures 1.1-C, 1.2-C and 1.3-C address the studied Class A AM station during critical hours periods under Alternative 1 (Class A AM stations afforded no protection from other AM stations during critical hours). Figures 2.1-C, 2.2-C and 2.3-C document the studied Class A AM station during critical hours periods under Alternative 2 of the *SFNPRM* (protection of a Class A AM station during critical hours only to its 0.5 mV/m groundwave contour by amending 47 C.F.R. Section 73.190 critical hours figures to reference the distance from the Class A AM station's 0.5 mV/m contour in lieu of its 0.1 mV/m contour). These Critical Hours Alternative 1 and Alternative 2 studies reflect increasing interference (shaded red) to currently served populations by the studied Class A AM station at the intervals of one-hour, one-half hour, and one-quarter hour before sunset.

Daytime operations under the *SFNPRM* proposal are addressed in Figures 1-D through 4-D. Figure 1-D documents the daytime operations of the studied Class A AM station as currently protected (to its 0.1 mV/m daytime groundwave contour), as well

3 Based on a sampling analysis, *SFNPRM* Nighttime Alternative 2 generally is expected to authorize even more interference to the listeners of Class A AM stations than pursuant to *SFNPRM* Nighttime Alternative 1.

4 In situations where the non-Class A AM station has more than one FM translator authorization, only the FM translator facility closest to the theoretical nighttime AM gain area has been mapped.

as the predicted interference within that contour that would result if nearby AM stations operated with the maximum powers permitted in the direction of the studied Class A AM station as proposed in the *SFNPRM* (protecting only the 0.5 mV/m daytime groundwave contour of the Class A AM station). Figures 2-D through 4-D document the potential daytime population gain – solely in the direction of the studied Class A AM station as other stations may limit power gains in other directions – for the individual interfering stations, assuming the daytime protection to only the 0.5 mV/m groundwave contour was adopted as proposed in the *SFNPRM*.

Following the Figures are charts tabulating the results of these nighttime, critical hours and daytime studies.

In addition, the summary pages of the "Grid Based Incoming Interference Population Report(s)" conducted for the nighttime, critical hours and daytime analysis of the studied Class A AM station are also attached. Due to their length, only the summaries, and not the entire Grid Based Incoming Interference Population Report(s) are attached; the entire Report(s) are available upon the request of the FCC or any interested party.

Below is a summary of the methodology of the conducted coverage and interference studies in regard to the studied Class A AM station as documented in the attached figures and charts:

Nighttime

Figure 1-N maps the studied Class A AM station's nighttime 0.5 mV/m 50% skywave contour (red line), which is currently protected, along with the Class A AM station's nighttime 0.5 mV/m groundwave contour (blue line) which is proposed to be protected under Nighttime Alternative 1 of the *SFNPRM*. The resulting zone subject to new interference from co-channel Class D stations adding nighttime operations is shown in

red shading, and the currently-served population and population subject to such new interference are detailed in red on Figure 1-N. In determining the interference to the studied Class A AM station, the nighttime operation for each impinging Class D AM station is based on protecting the 0.5 mV/m groundwave contour of the studied Class A AM station pursuant to Nighttime Alternative 1 of the *SFNPRM*. Generally, the impinging Class D AM stations are non-directional. In those few instances where the Class D AM station employs a directional pattern, the presumed Class D AM station power has been limited in the direction of the studied Class A AM station's 0.5 mV/m groundwave contour and has not been verified for protection limits in other directions.

Figures 2-N through 11-N show the nighttime interference-free contour for each co-channel Class D interfering AM station assuming nighttime operations with maximum permissible power, while protecting only the nighttime 0.5 mV/m groundwave contour of the studied Class A AM station pursuant to Nighttime Alternative 1 of the *SFNPRM*. The potential nighttime population and area gains resulting from such co-channel Class D stations operating with maximum allowed power in the direction of the studied Class A AM station's protected 0.5 mV/m groundwave contour is also detailed in red on each figure. A tabulation of the nighttime study results is provided following all the figures.

Critical Hours

Figures 1.1-C through 1.3-C and Figures 2.1-C through 2.3-C each show the daytime 0.1 mV/m groundwave contour (blue line) and the 0.5 mV/m groundwave contour (red line) of the studied Class A AM station. There are three studies in each set, employing skywave diurnal factors (FCC Section 73.190 Figure 13) for the time frames of (i) one hour prior to sunset (SS-1), (ii) ½ hour prior to sunset (SS-0.5), and (iii) ¼ hour prior to sunset (SS-0.25). Predicted interference within the respective contours is shown in red shading.

Under Critical Hours Alternative 1 of the *SFNPRM,* neighboring stations to a Class A AM station (which in this instance are Class D stations) could continue to operate at full daytime power during critical hours. The interference to the studied Class A AM station from such unrestricted power operations of its neighbors during critical hours per Alternative 1 of the *SFNPRM* is documented in red shading on Figures 1.1-C, 1.2-C and 1.3-C, for each respective time period (one hour, ½ hour and ¼ hour prior to sunset).

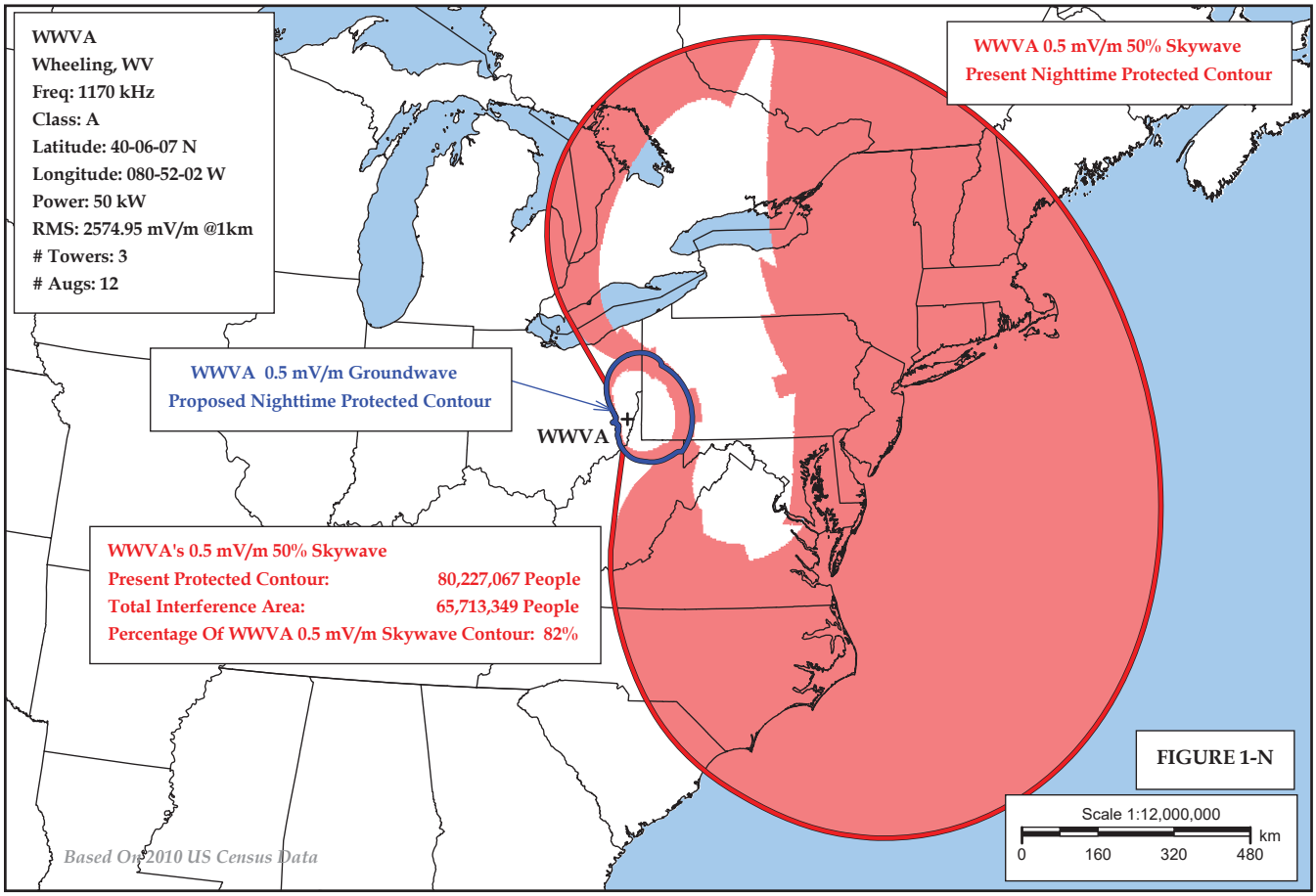
Pursuant to Critical Hours Alternative 2 of the *SFNPRM*, the Commission would change the vertical axis reference for application of Figures 9, 10 and 11 of 47 C.F.R. Section 73.190 from "Distance from 0.1 mV/m Contour in Miles" to "Distance from 0.5 mV/m Contour in Miles." The interference to the studied Class A AM station from such revised permissible power calculations for its neighbors during critical hours per Alternative 2 of the *SFNPRM* is documented in red shading on Figures 2.1-C, 2.2-C and 2.3-C, for each respective time period (one hour, ½ hour and ¼ hour prior to sunset).

The box on the upper left-hand corner of each Critical Hours figure sets forth the data for the population, area and percentage impact of the resulting interference under the reviewed Critical Hours Alternative on the studied Class A AM station's 0.1 mV/m contour; the box on the upper right-hand corner, on the studied Class A AM station's 0.5 mV/m contour. A tabulation of the critical hours study results is provided following all the figures.

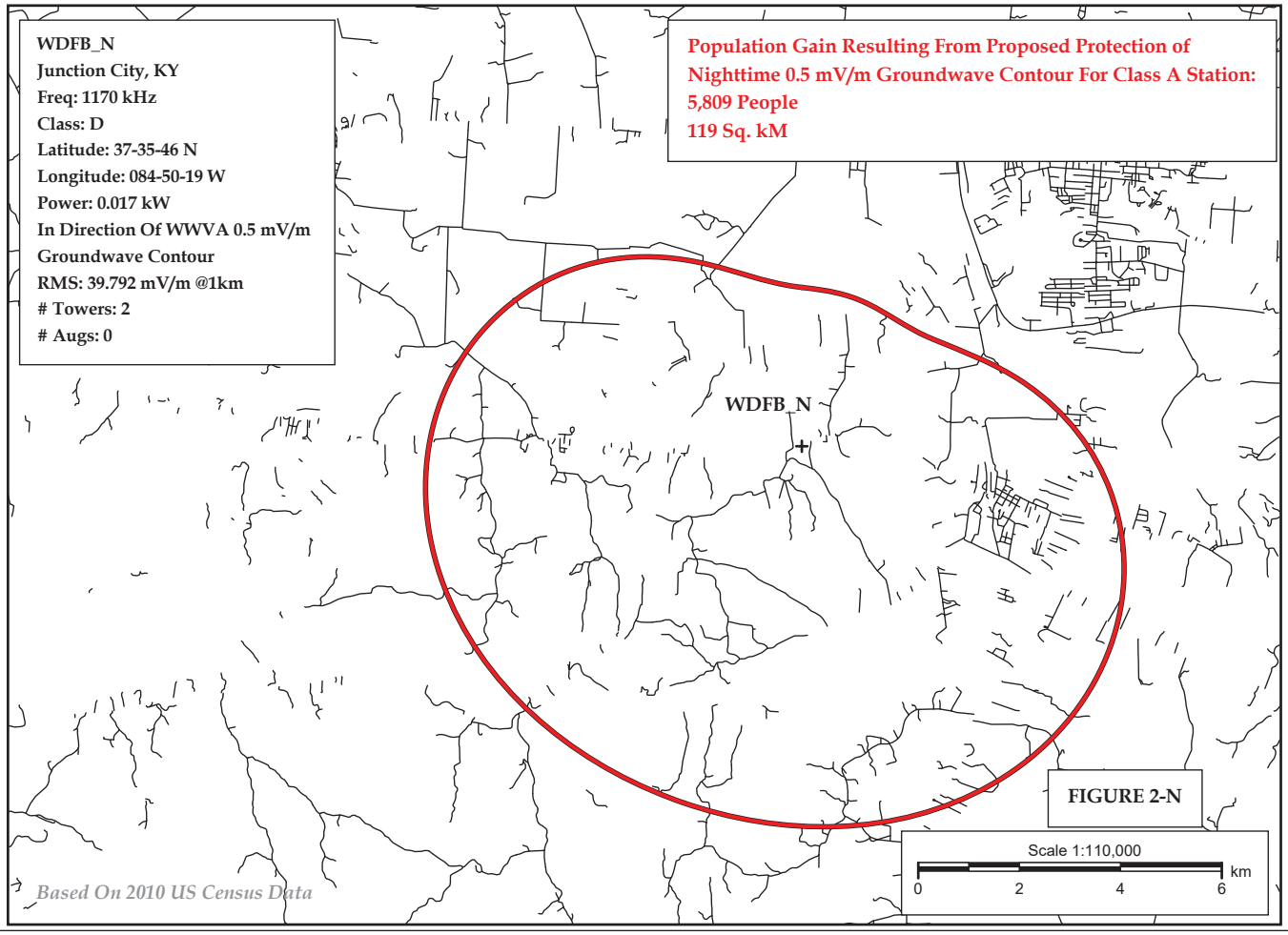
Daytime

For the studied Class A AM station, Figure 1-D maps the present daytime protected 0.1 mV/m groundwave contour (blue line) as well as the less-encompassing daytime 0.5 mV/m groundwave contour (red line) proposed to be protected from co-channel interference in the *SFNPRM*. The interference area resulting from nearby co-channel stations (typically Class D AM stations) operating with maximum potential power (up to 50 kW) in the direction of the studied Class A AM daytime 0.5 mV/m groundwave contour is shown in red shading. The box at the upper right-hand corner of Figure 1-D details the currently protected population within the studied Class A AM station's daytime 0.1 mV/m groundwave contour, the population within that contour that would be subject to interference if only the daytime 0.5 mV/m groundwave contour is protected as proposed in the *SFNPRM*, and the percentage of the current population now served that such interference zone encompasses.

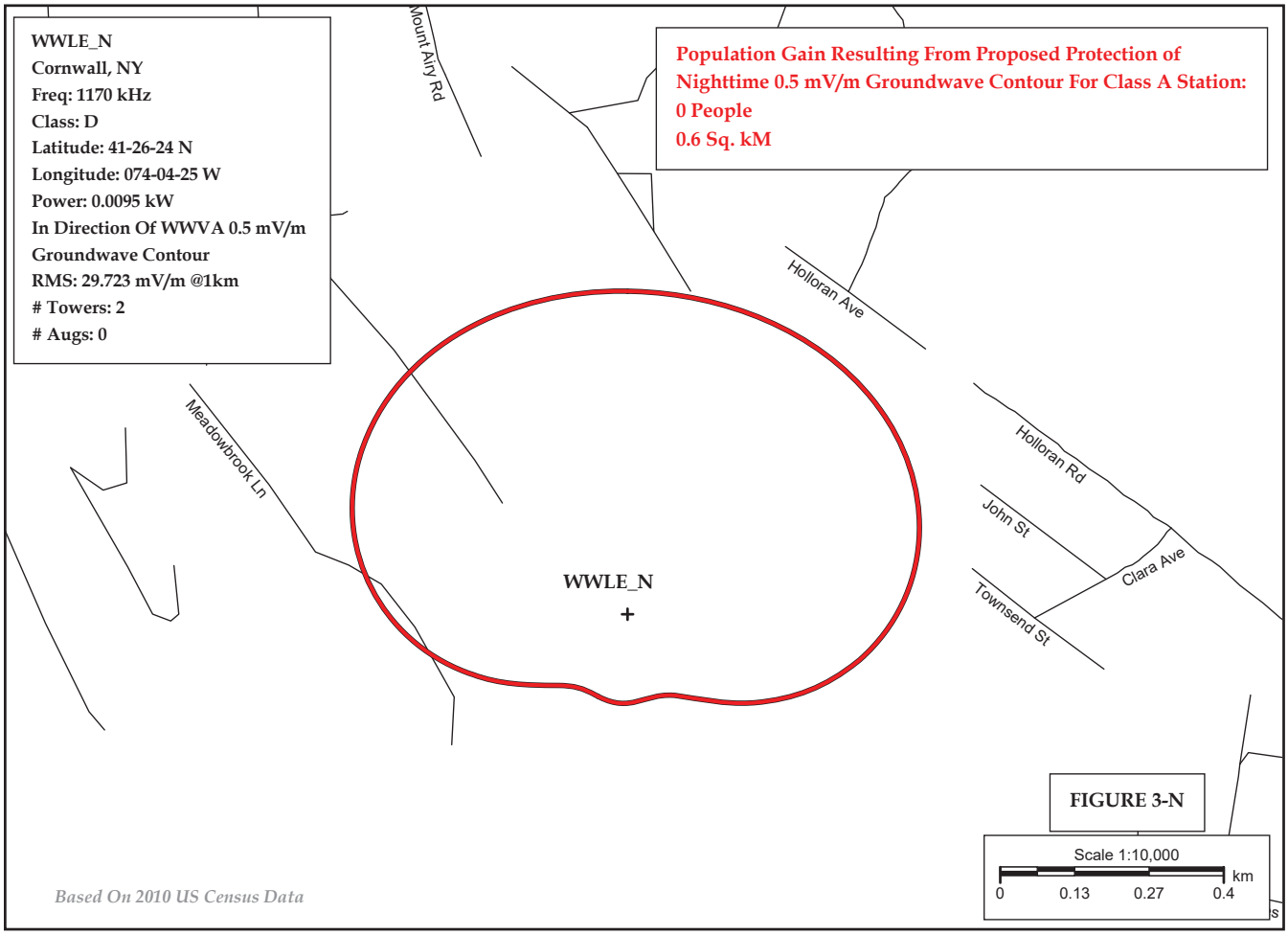
Figures 2-D through 4-D document the potential daytime population gain for the individual interfering stations in the direction of the studied Class A AM station with daytime protection to the Class A AM station's 0.5 mV/m groundwave contour, as proposed in the *SFNPRM*. The boundaries for the gain areas are the difference between the licensed and potential 0.5 mV/m groundwave contours of the interfering station through the arc of the Class A AM station's protected 0.5 mV/m groundwave contour, as detailed on each of Figures 2-D through 4-D. Individually and collectively, the potential daytime population gains by the interfering stations in the direction of the now-limiting Class A AM station under the *SFNPRM* daytime proposal constitutes a tiny percentage of the population that would be subject to new interference to their daytime reception of the studied Class A AM station. A tabulation of the daytime study results is provided following all the figures.



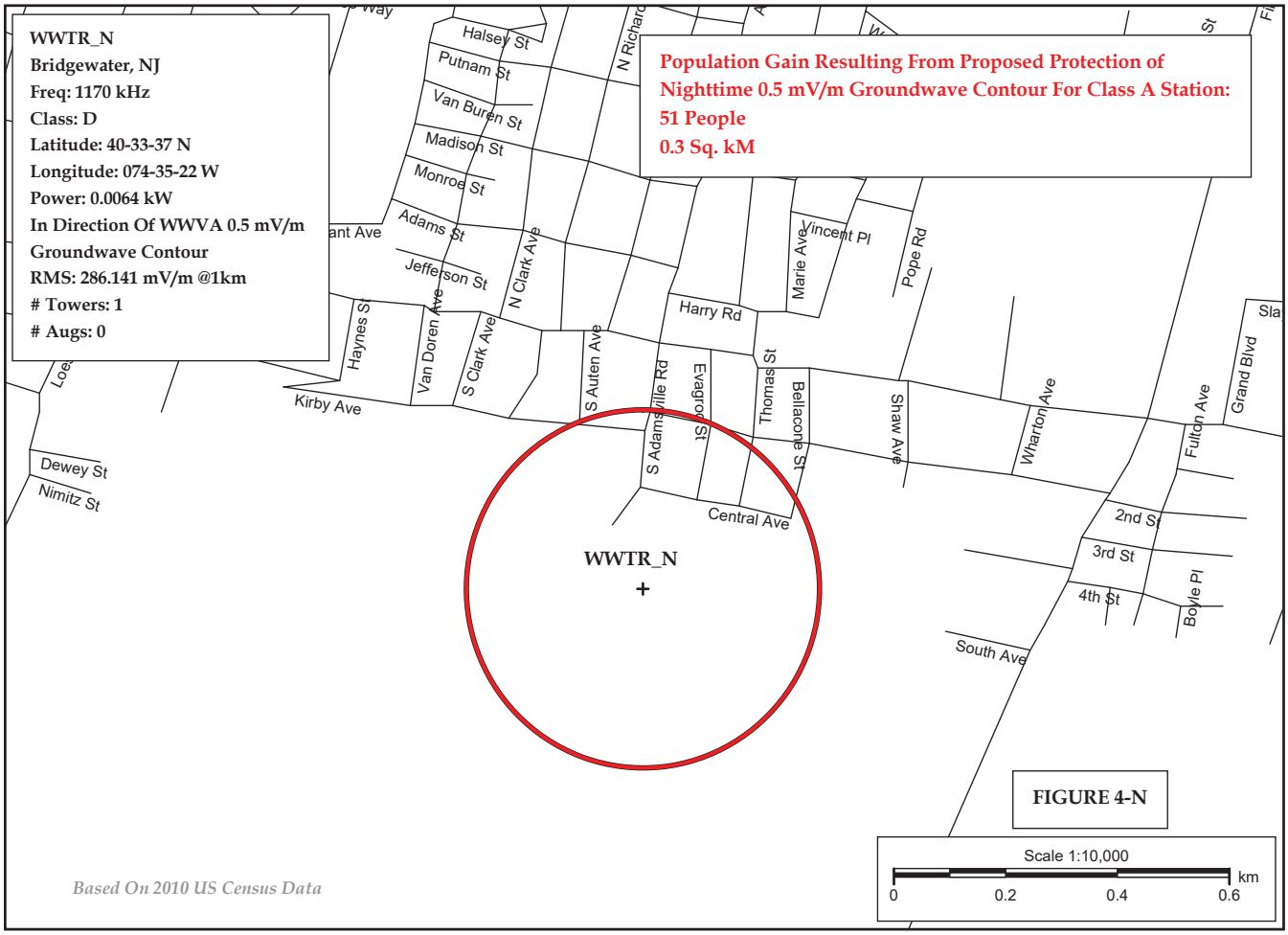
Predicted Nighttime Interference Area To The Present Protected WWVA 0.5 mV/m 50% Skywave Nighttime Contour From Co-Channel Class D Stations WDFB, WWLE, WWTR, WCTF, WCXN, WCLN, WQHC, WDEK, WFPB, and WFDL Operating With Maximum Allowed Power In The Direction Of WWVA's 0.5 mV/m Groundwave Contour



WDFB NIF 3.41 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



WWLE NIF 67.7 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



WWTR NIF 67.7 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour

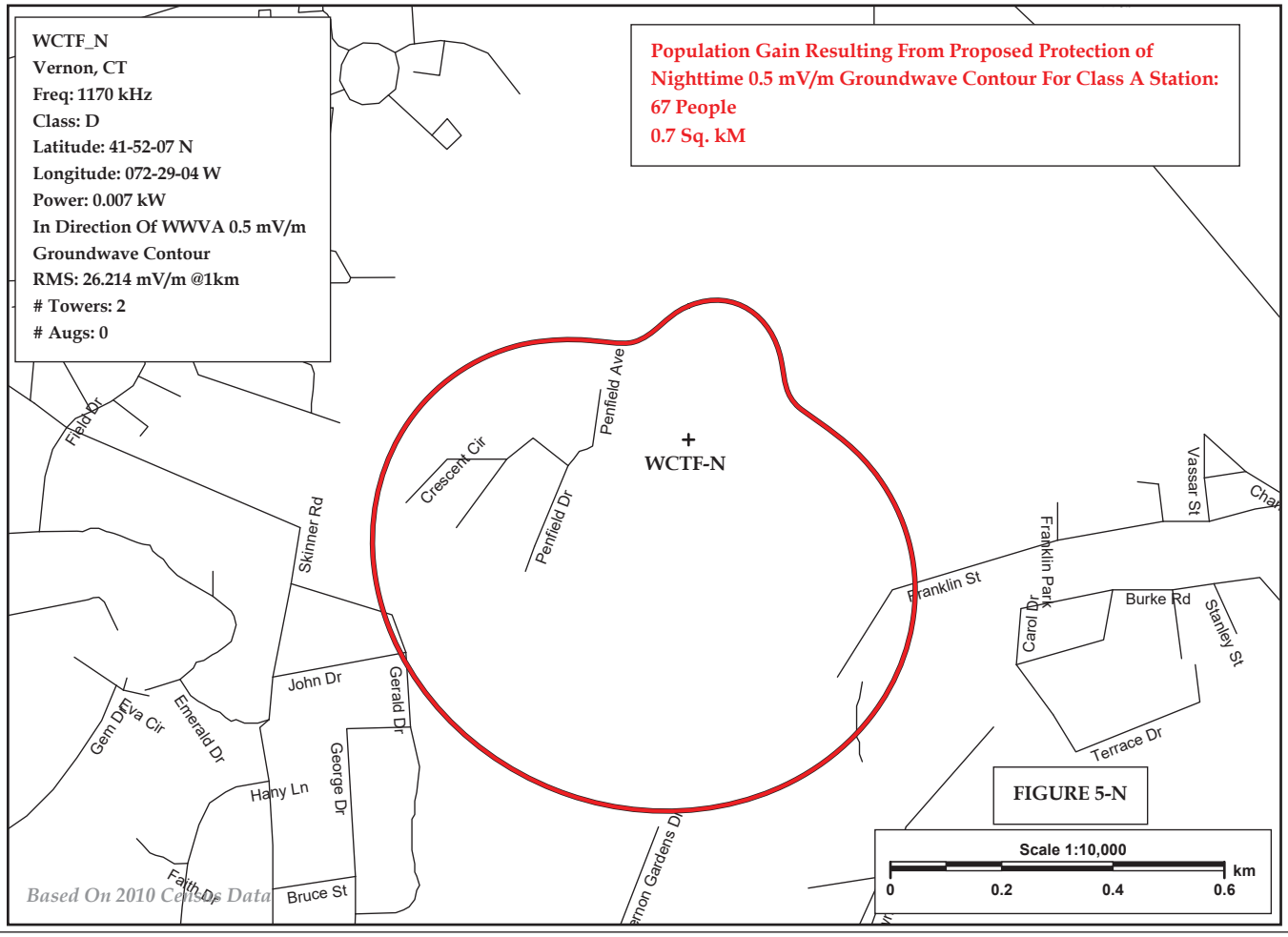
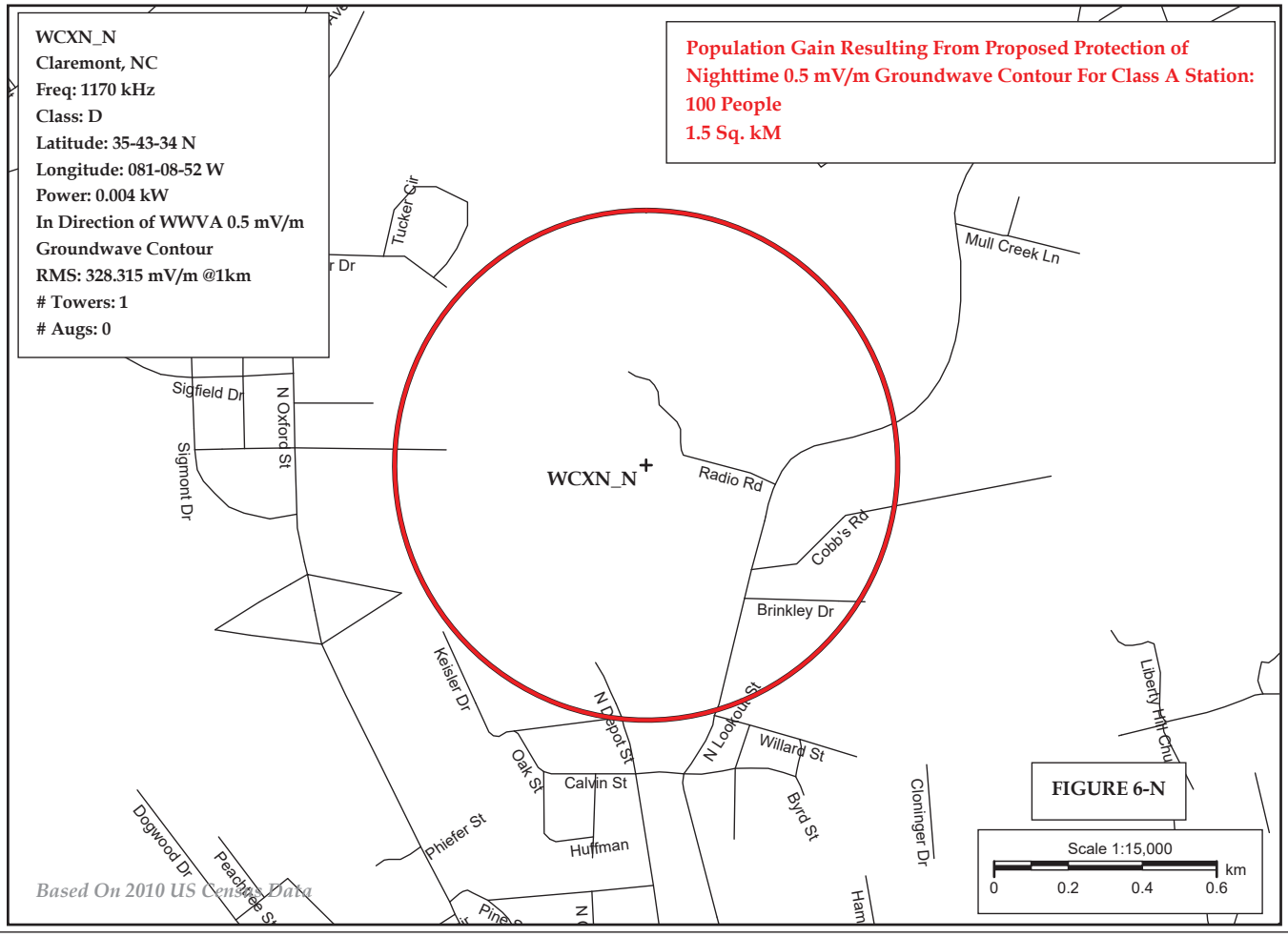
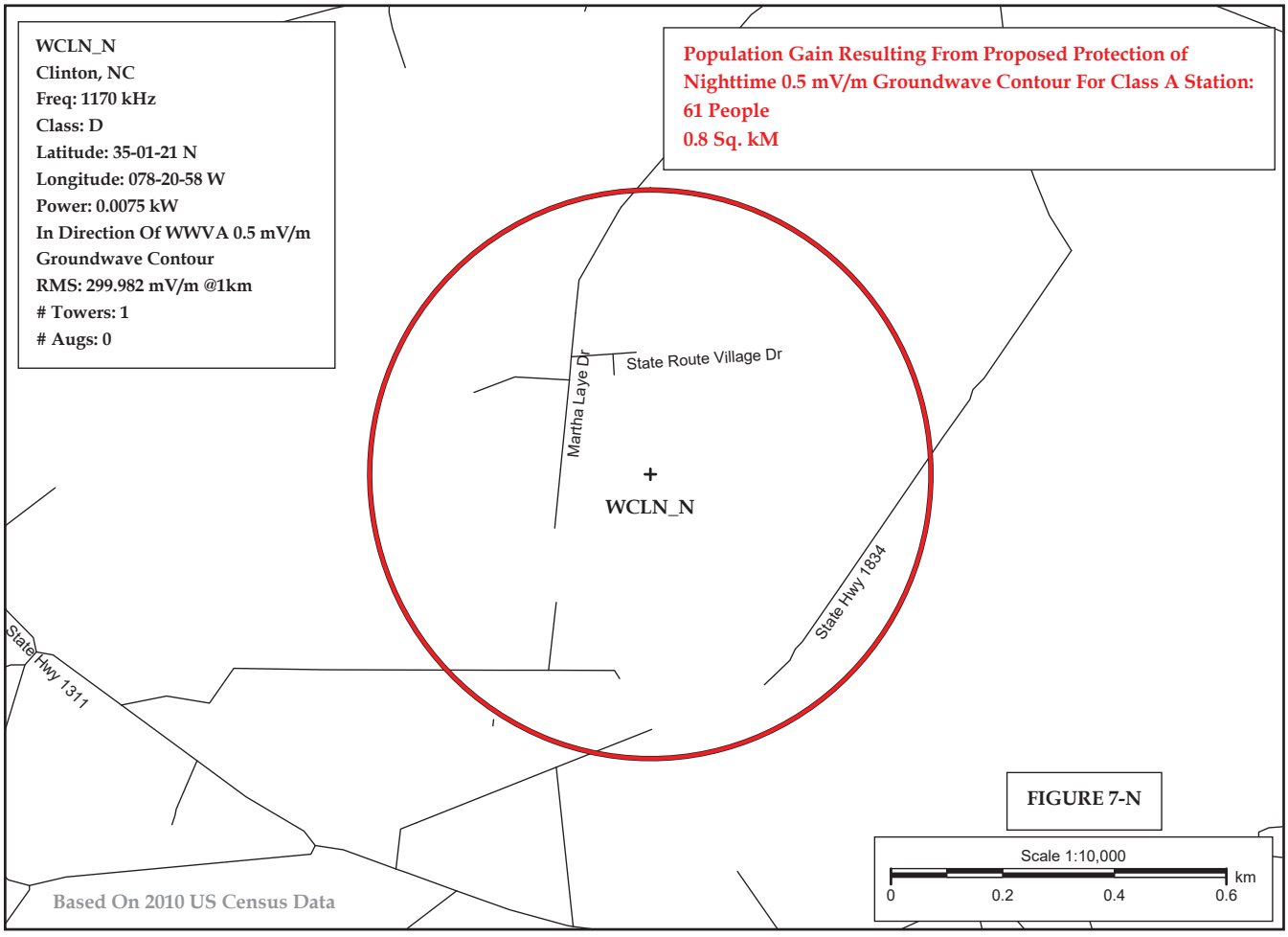


FIGURE 5-N

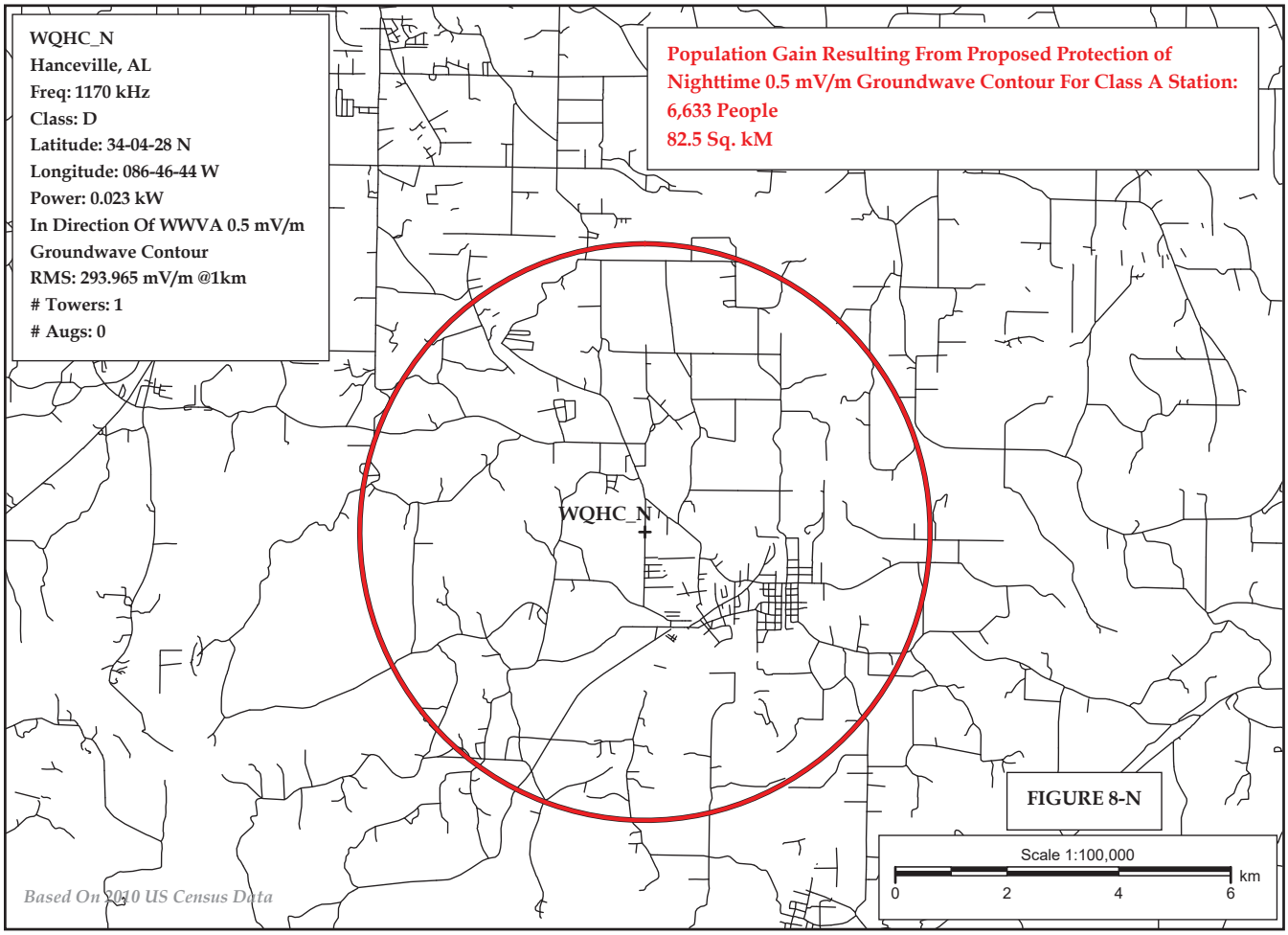
WCTF NIF 50.0 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



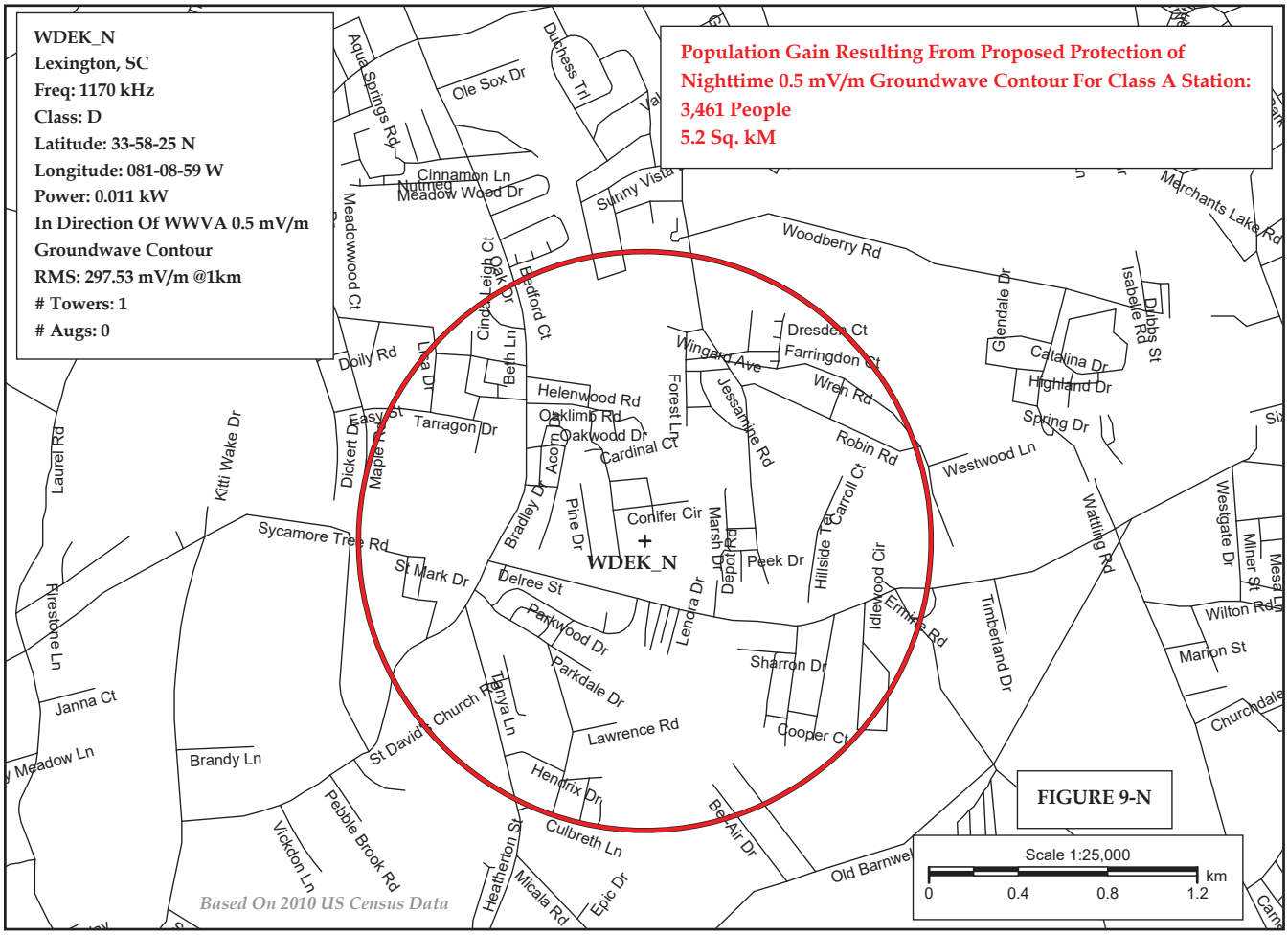
WCXN NIF 23.0 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



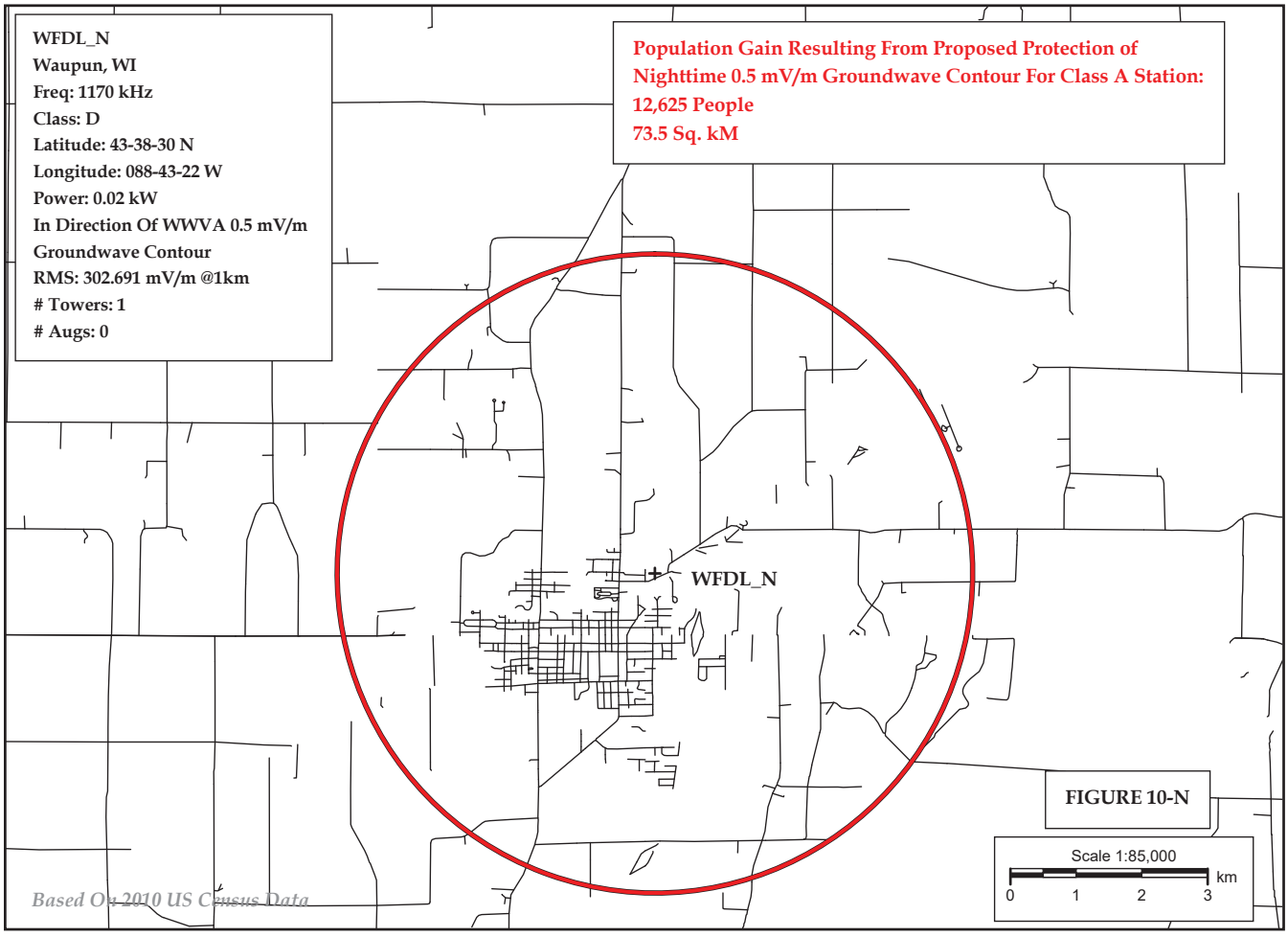
WCLN NIF 40.8 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



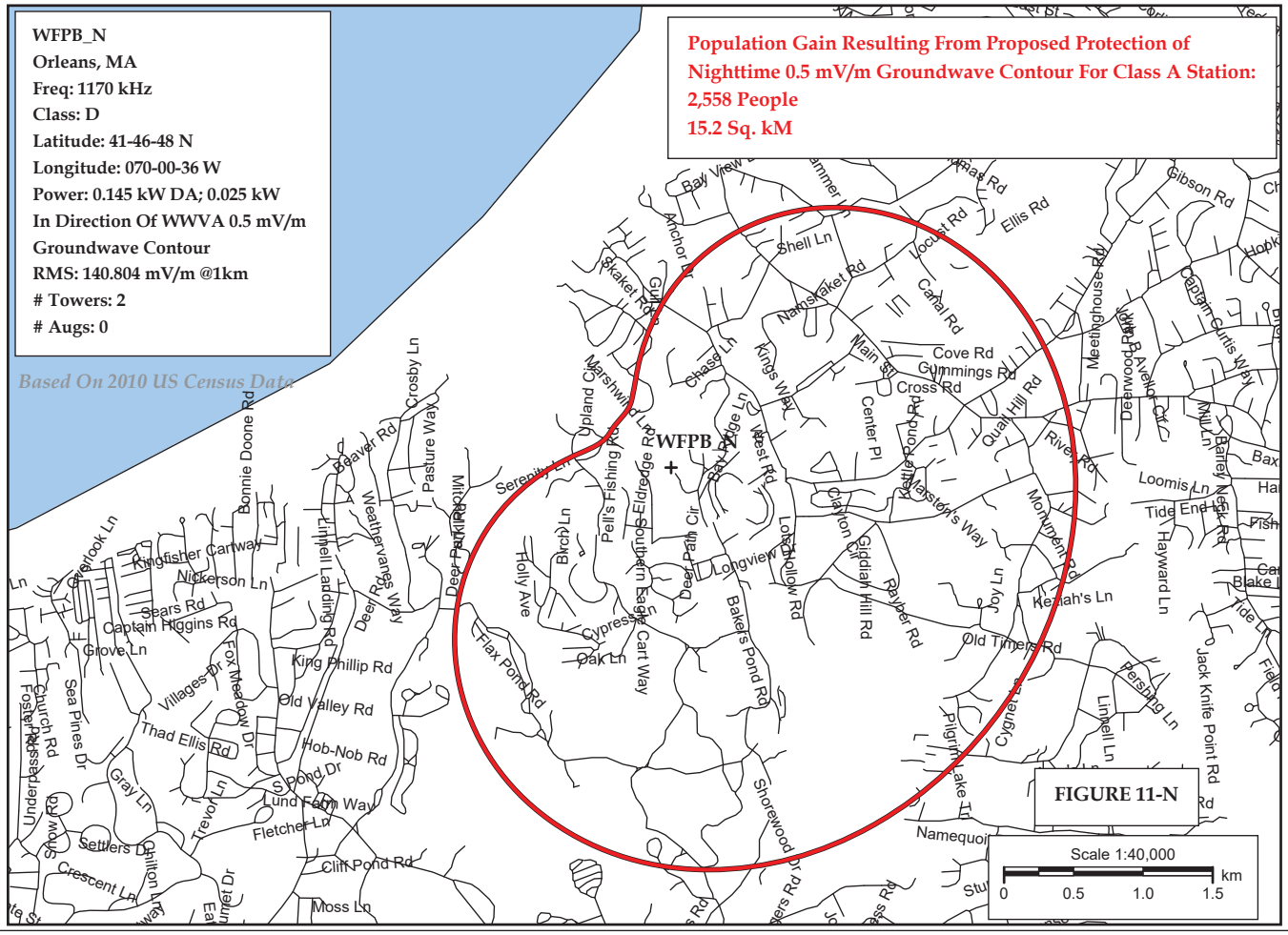
WQHC NIF 3.0 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour



WDEK NIF 15.9 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour

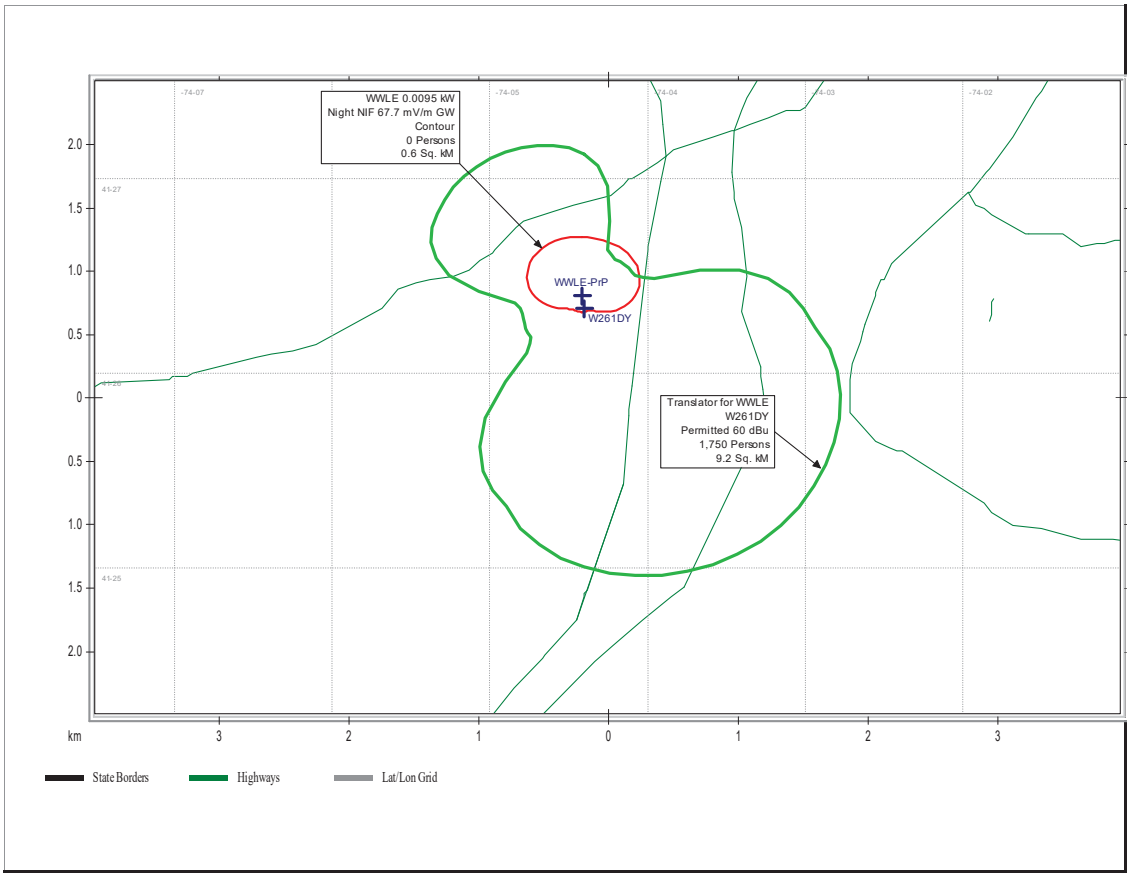


WFDL NIF 6.8 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour

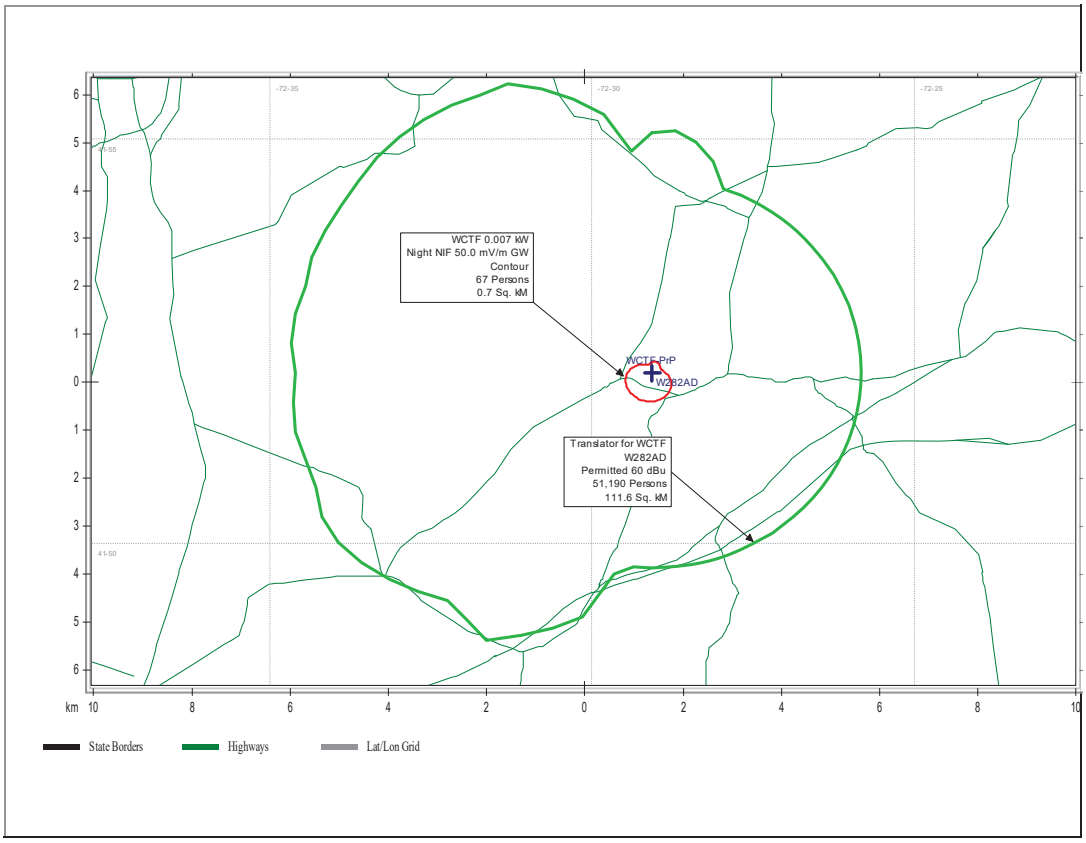


WFPB NIF 34 mV/m Groundwave Contour With Protection To Class A Station WWVA Proposed Protected 0.5 mV/m Groundwave Nighttime Contour

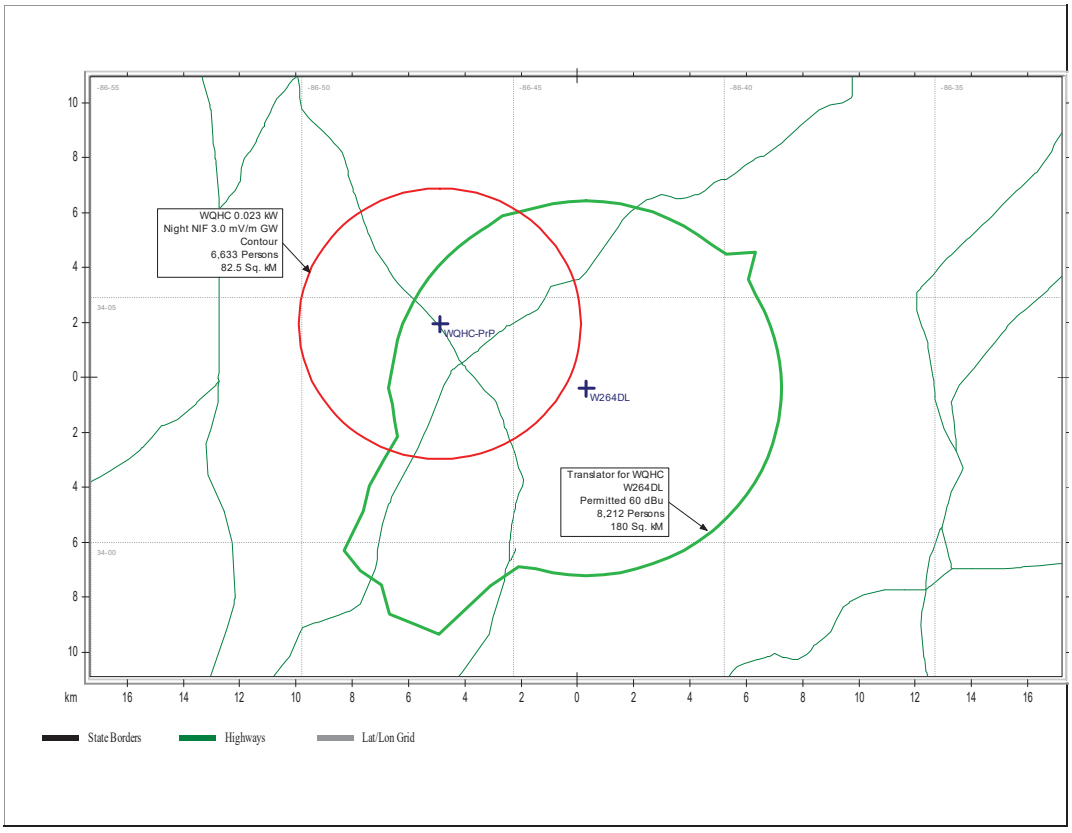
WWLE


WWLE 0.0095 kW
Night NIF 67.7 mV/m GW
Contour
0 Persons
0.6 Sq. kM
WWLE-PrP
W261DY
Translator for WWLE
W261DY
Permitted 60 dBu
1,750 Persons
9.2 Sq. kM
km
State Borders
Highways
Lat/Lon Grid

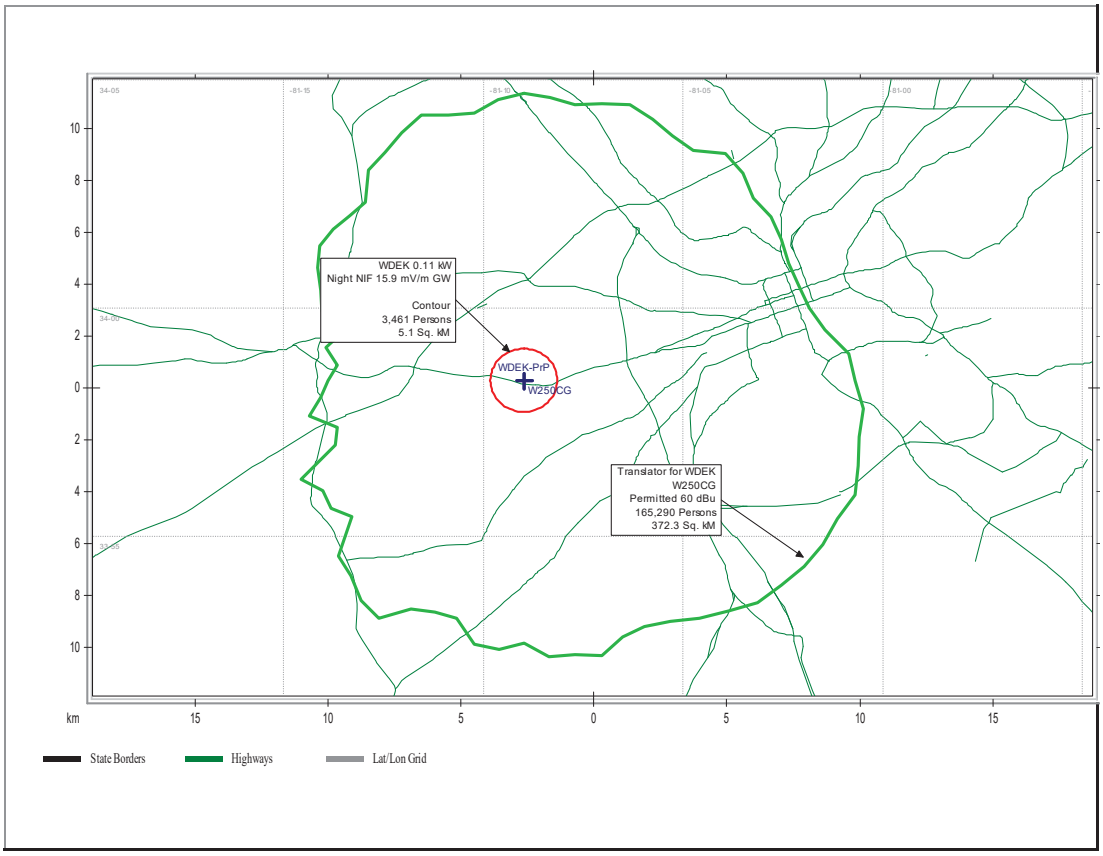
WCTF


WCTF 0.007 kW
Night NIF 50.0 mV/m GW
Contour
67 Persons
0.7 Sq. kM
WCTF PrP
W282AD
Translator for WCTF
W282AD
Permitted 60 dBu
51,190 Persons
111.6 Sq. kM
-72-35
-72-30
-72-25
41-55
41-50
km 10 8 6 4 2 0 2 4 6 8 10
State Borders
Highways
Lat/Lon Grid

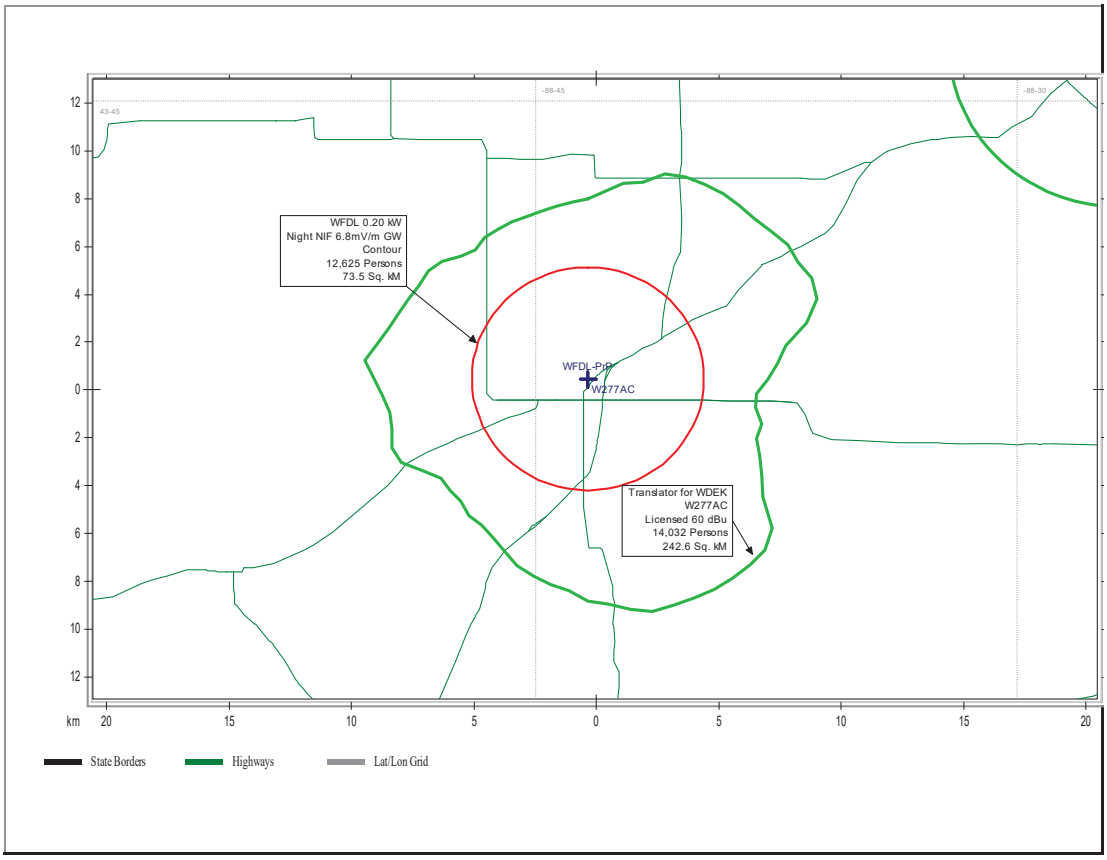
WQHC


WQHC 0.023 kW
Night NIF 3.0 mV/m GW
Contour
6,633 Persons
82.5 Sq. kM
WQHC-PrP
W264DL
Translator for WQHC
W264DL
Permitted 60 dBu
8,212 Persons
180 Sq. kM
-86-55
-86-50
-86-45
-86-40
-86-35
34-05
34-00
km
State Borders
Highways
Lat/Lon Grid

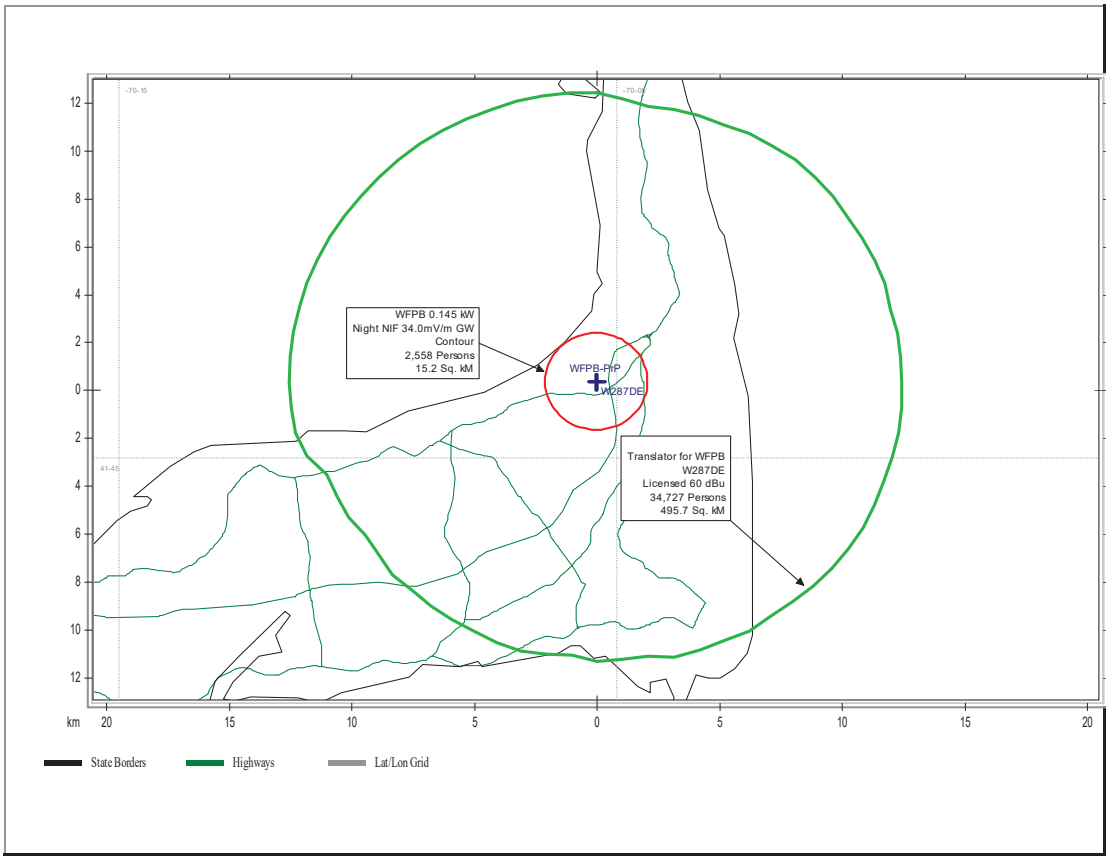
WDEK


WDEK 0.11 kW
Night NIF 15.9 mV/m GW
Contour
3,461 Persons
5.1 Sq. kM
WDEK-PrP
W250CG
Translator for WDEK
W250CG
Permitted 60 dBu
165,290 Persons
372.3 Sq. kM
km
State Borders
Highways
Lat/Lon Grid

WFDL


WFDL 0.20 kW
Night NIF 6.8mV/m GW
Contour
12,625 Persons
73.5 Sq. kM
WFDL-PID
W277AC
Translator for WDEK
W277AC
Licensed 60 dBu
14,032 Persons
242.6 Sq. kM
km
State Borders
Highways
Lat/Lon Grid

WFPB


WFPB 0.145 kW
Night NIF 34.0mV/m GW
Contour
2,558 Persons
15.2 Sq. kM
WFPB-FM
W287DE
Translator for WFPB
W287DE
Licensed 60 dBu
34,727 Persons
495.7 Sq. kM
km
State Borders
Highways
Lat/Lon Grid

No FM Translators

WDFB

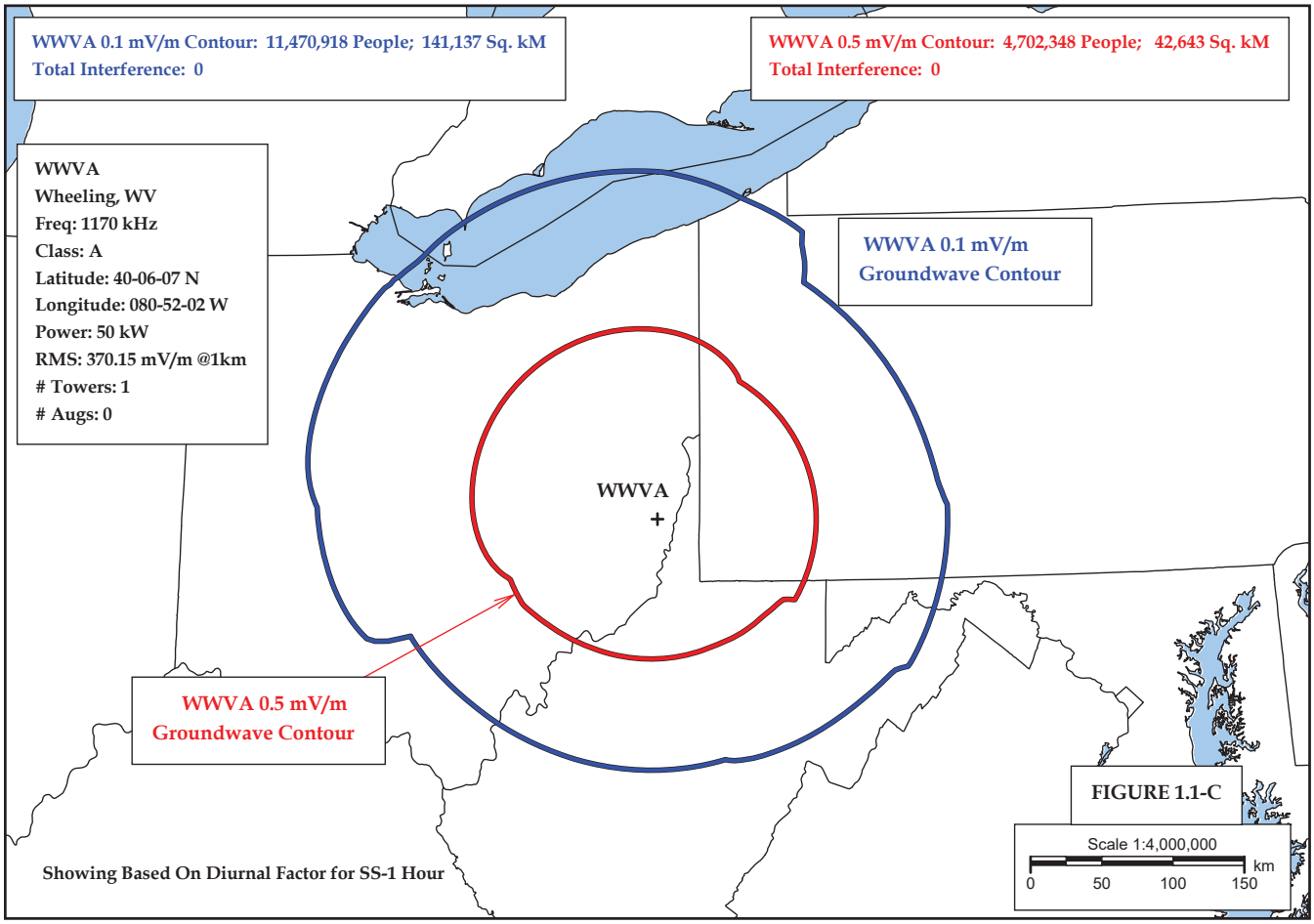
WWTR

WCXN

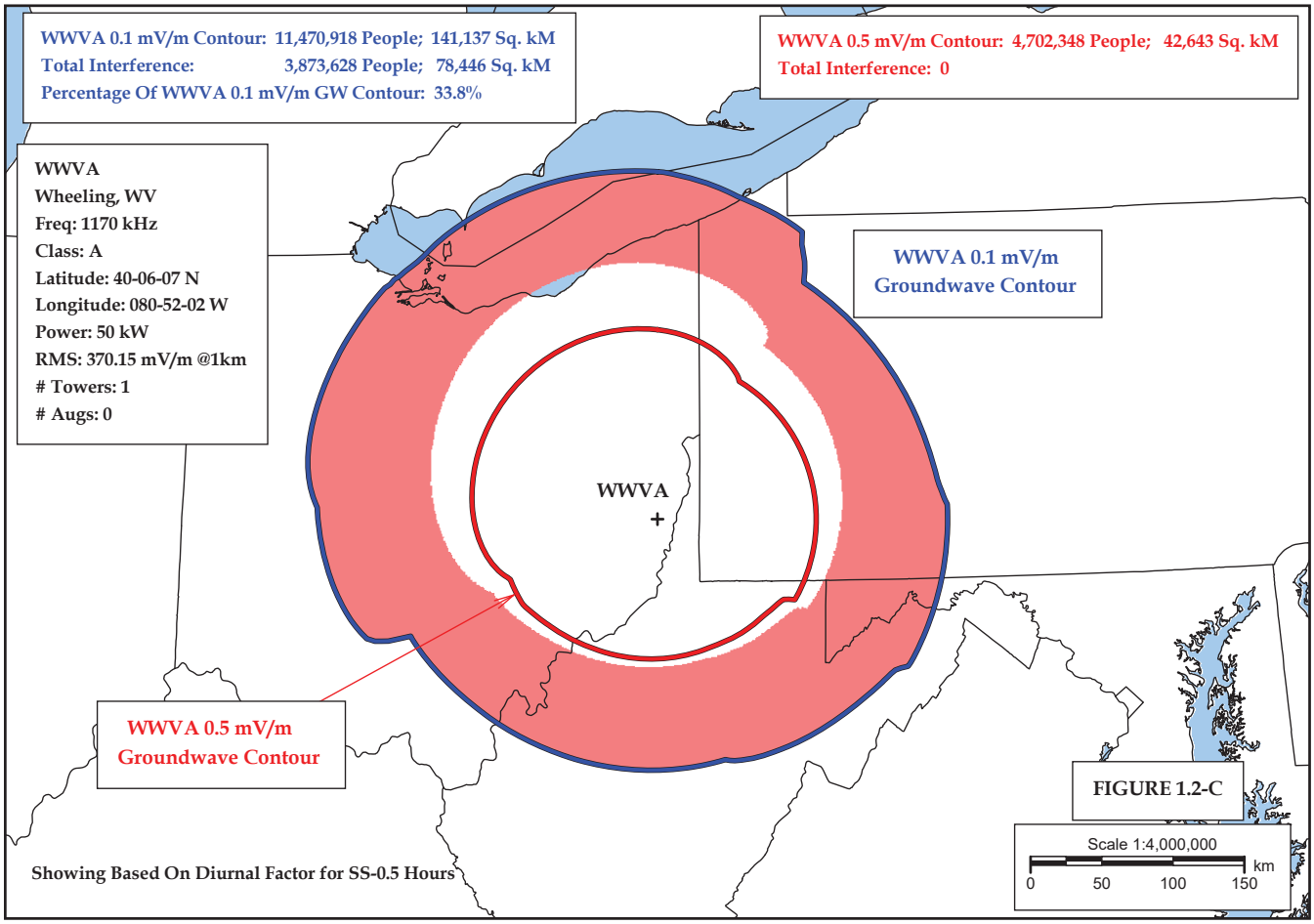
WCLN

Summary of FM Translator Studies/WWVA

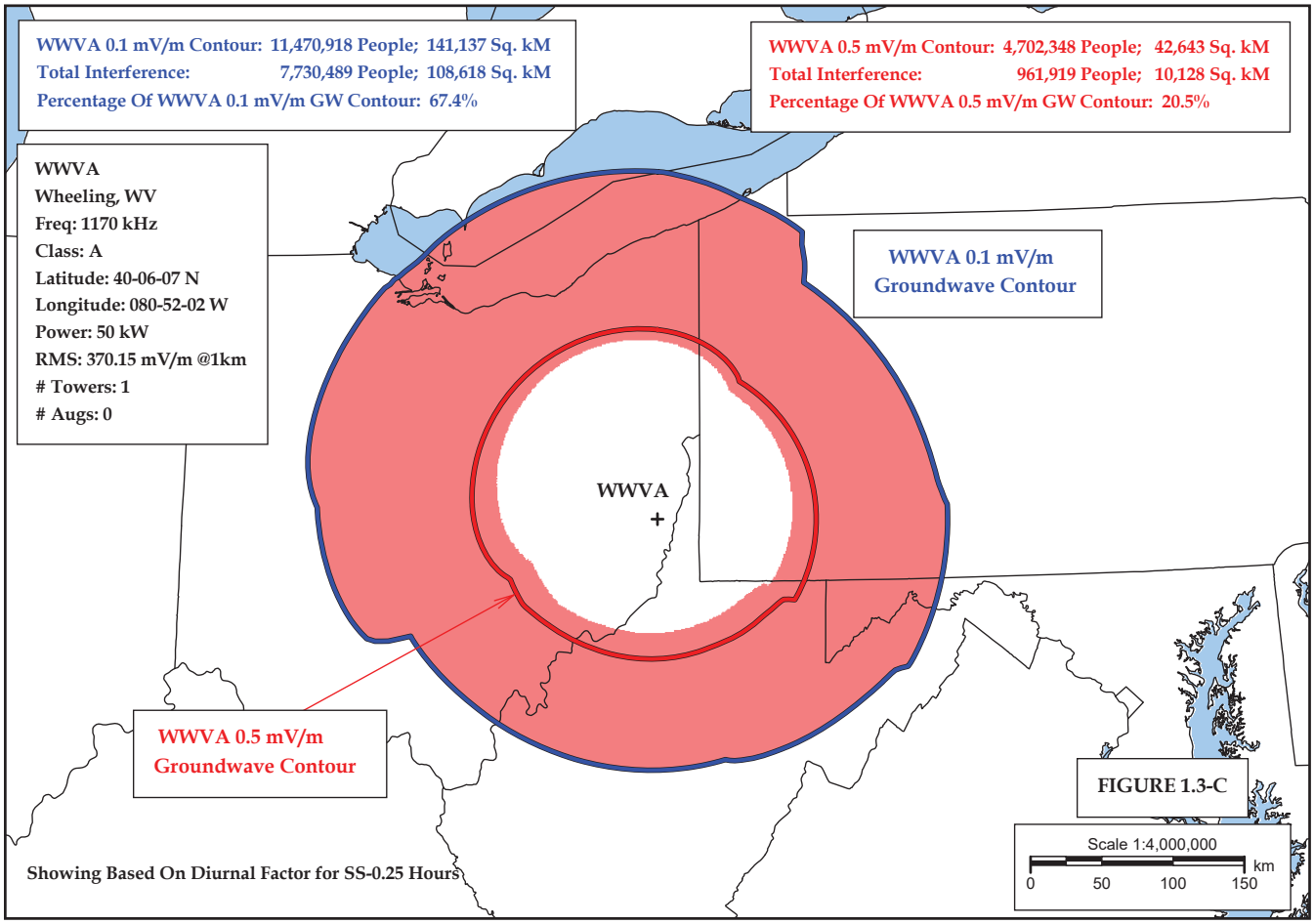
Class D AM Station Causing Interference to Class A Station WBT if Class D Operates with Maximum Power Per Nighttime Alternative 1	**FM Translator (License or Permit) Associated with Class D Station**	**Population Within FM Translator's 60 dBu Contour**	**Population Within Class D Station's Potential Nighttime Interference Free Contour Under Nighttime Alternative 1**
WDFB	N/A	N/A	5,809
WWLE	W261DY	1,750	0
WWTR	N/A	N/A	51
WCTF	W282AD	51,190	51,190
WCXN	N/A	N/A	100
WCLN	N/A	N/A	61
WQHC	W264DL	8,212	6,633
WDEK	W250CG	165,290	3,461
WFPB	W287DE	34,727	2,558
WFDL	W277AC	14,032	12,625
Cumulative Sum:		**275,201**	**31,365**



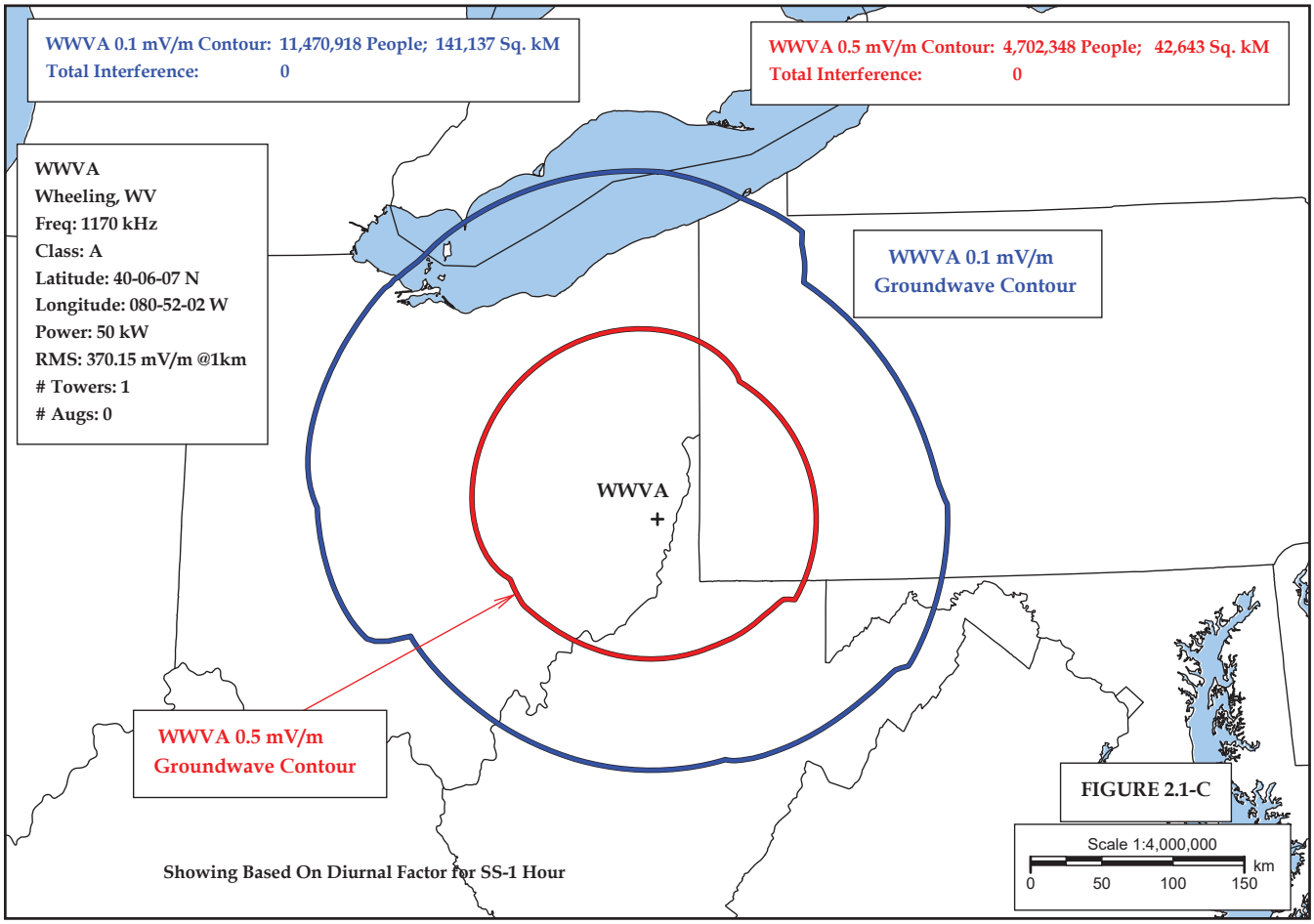
Alternative 1 - Proposed Critical Hours Interference to WWVA From The Licensed Daytime Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC and WDEK to Class A Station WWVA, Wheeling, WV for One Hour Before Sunset



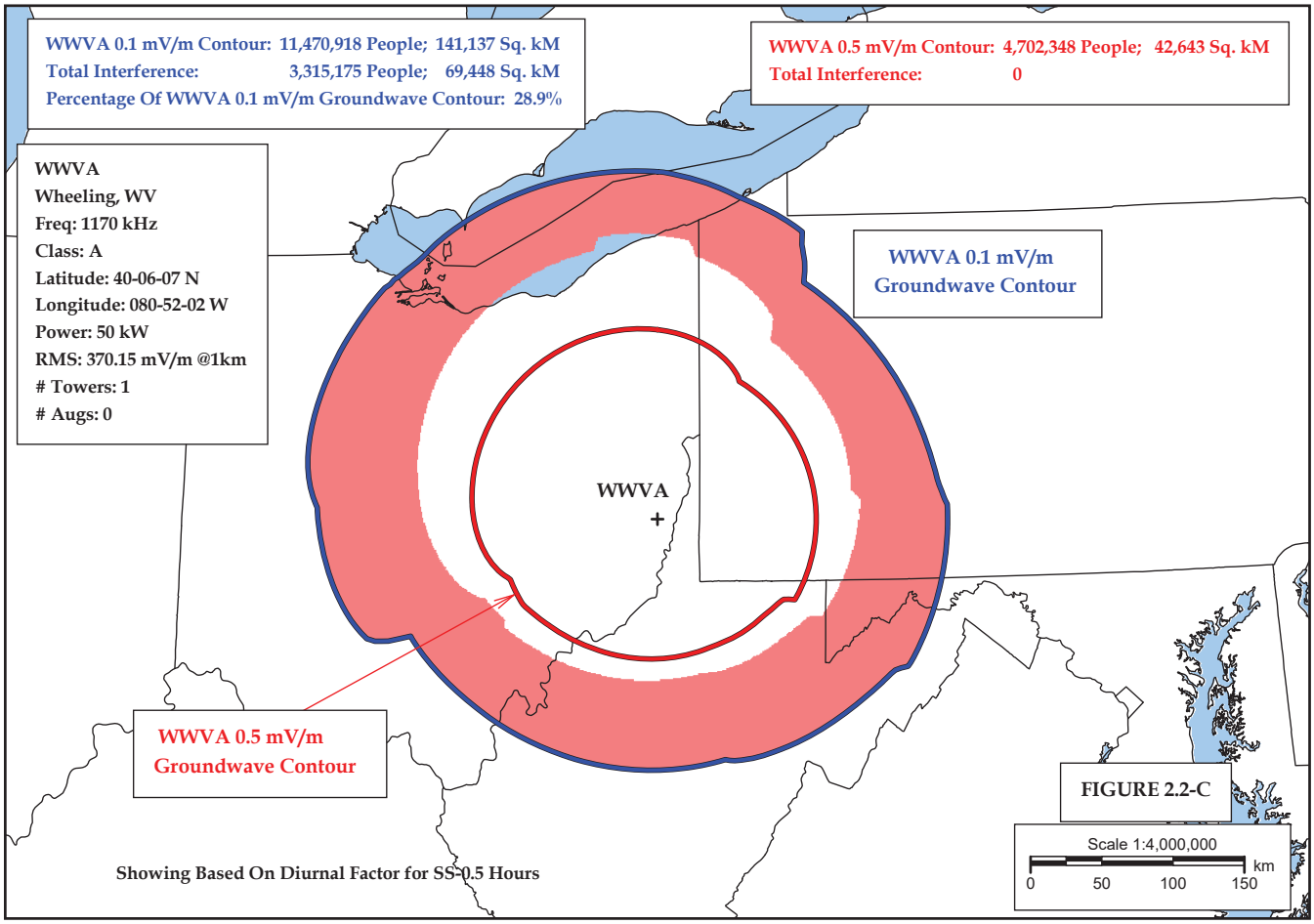
Alternative 1 - Proposed Critical Hours Interference From The Licensed Daytime Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC And WDEK To Class A Station WWVA, Wheeling, WV for One-Half Hour Before Sunset



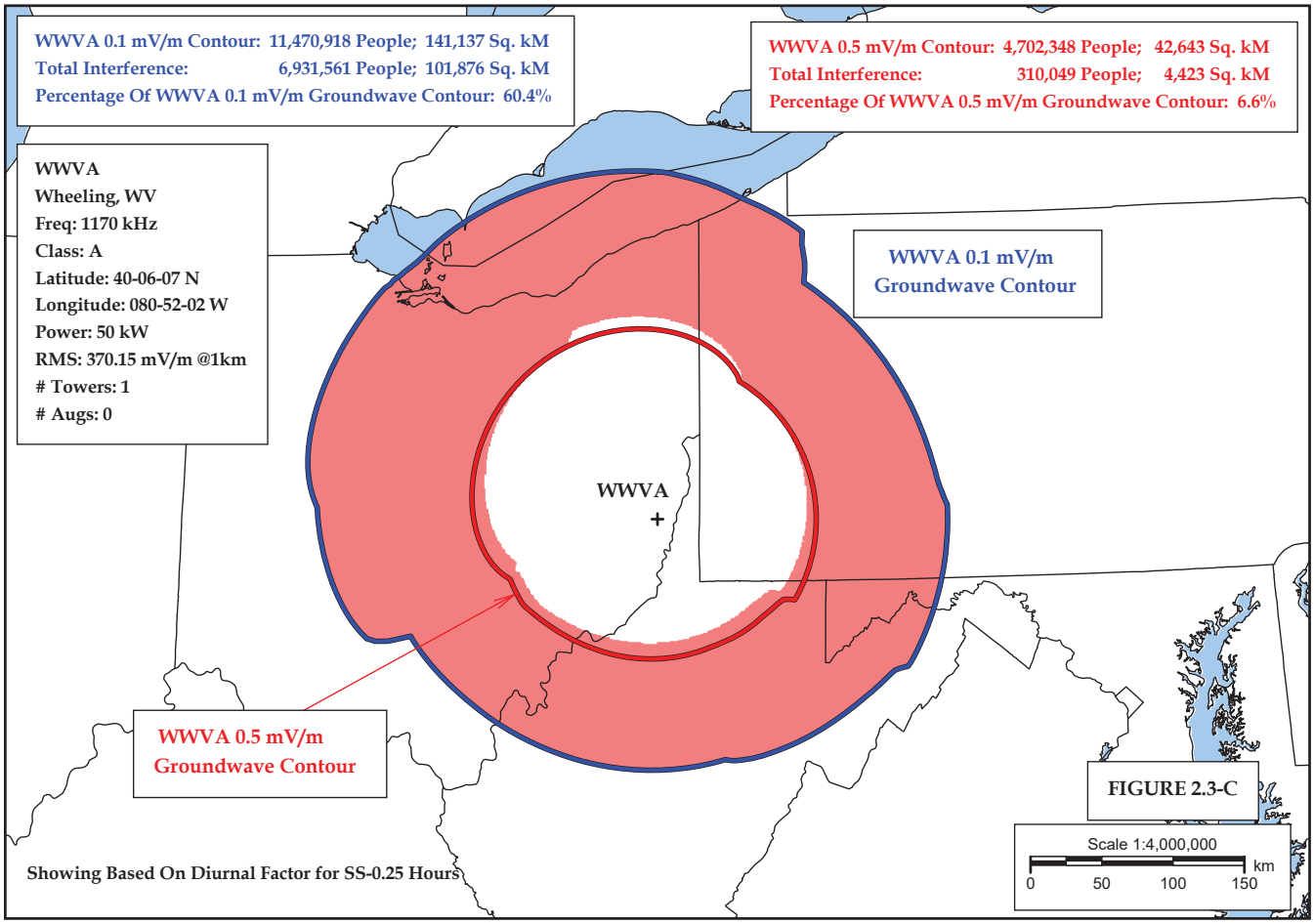
Alternative 1 - Proposed Critical Hours Interference From The Licensed Daytime Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC And WDEK To Class A Station WWVA, Wheeling, WV for One-Quarter Hour Before Sunset



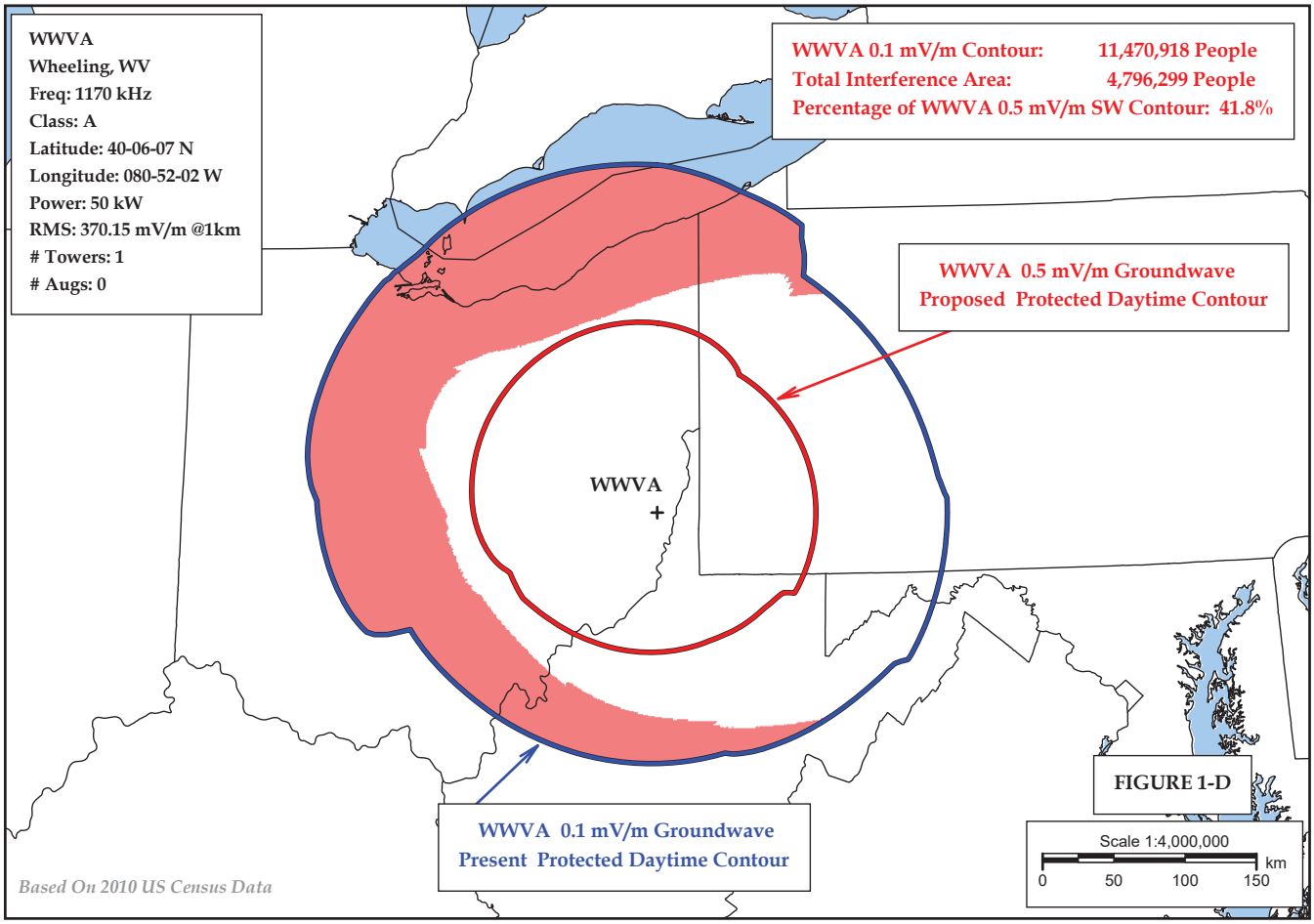
Alternative 2 - Proposed Critical Hours Interference From Potential Critical Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC And WDEK To Class A Station WWVA, Wheeling, WV for One Hour Before Sunset



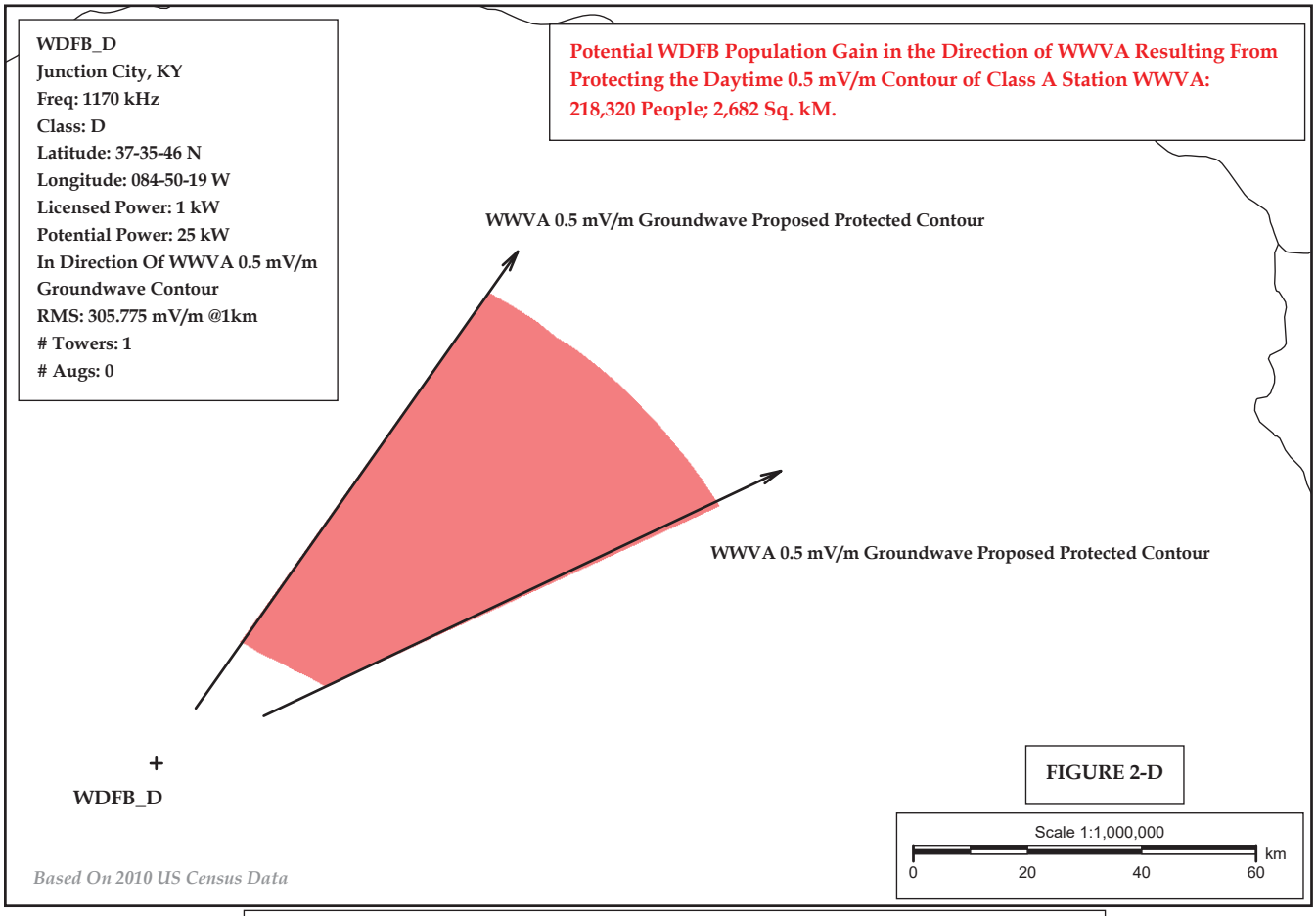
Alternative 2 - Proposed Critical Hours Interference From Potential Critical Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC And WDEK To Class A Station WWVA, Wheeling, WV for One-Half Hour Before Sunset



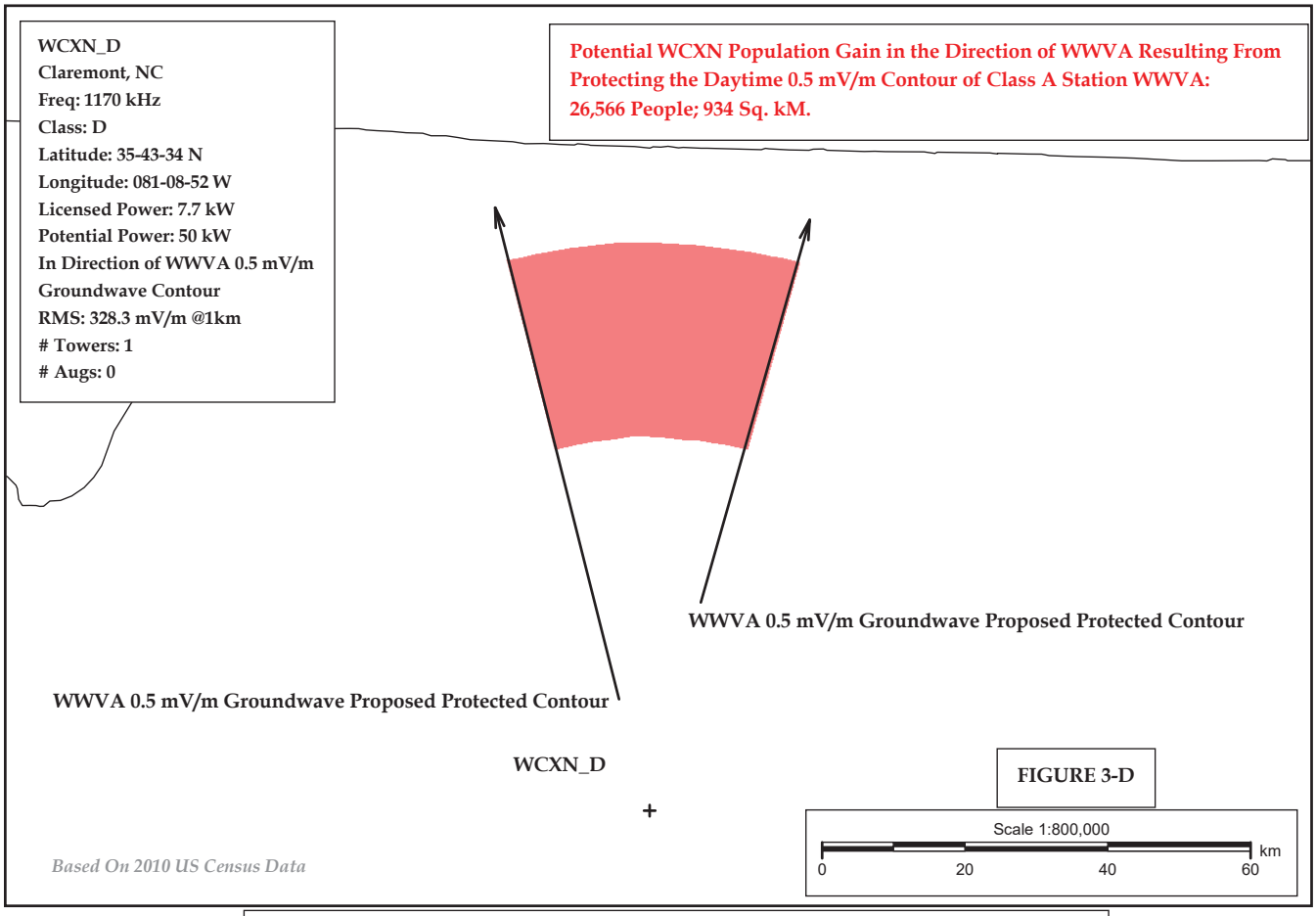
Alternative 2 - Proposed Critical Hours Interference From Potential Critical Hours Operation Of Stations WCLN, WCTF, KOWZ, WQHC And WDEK To Class A Station WWVA, Wheeling, WV for One-Quarter Hour Before Sunset



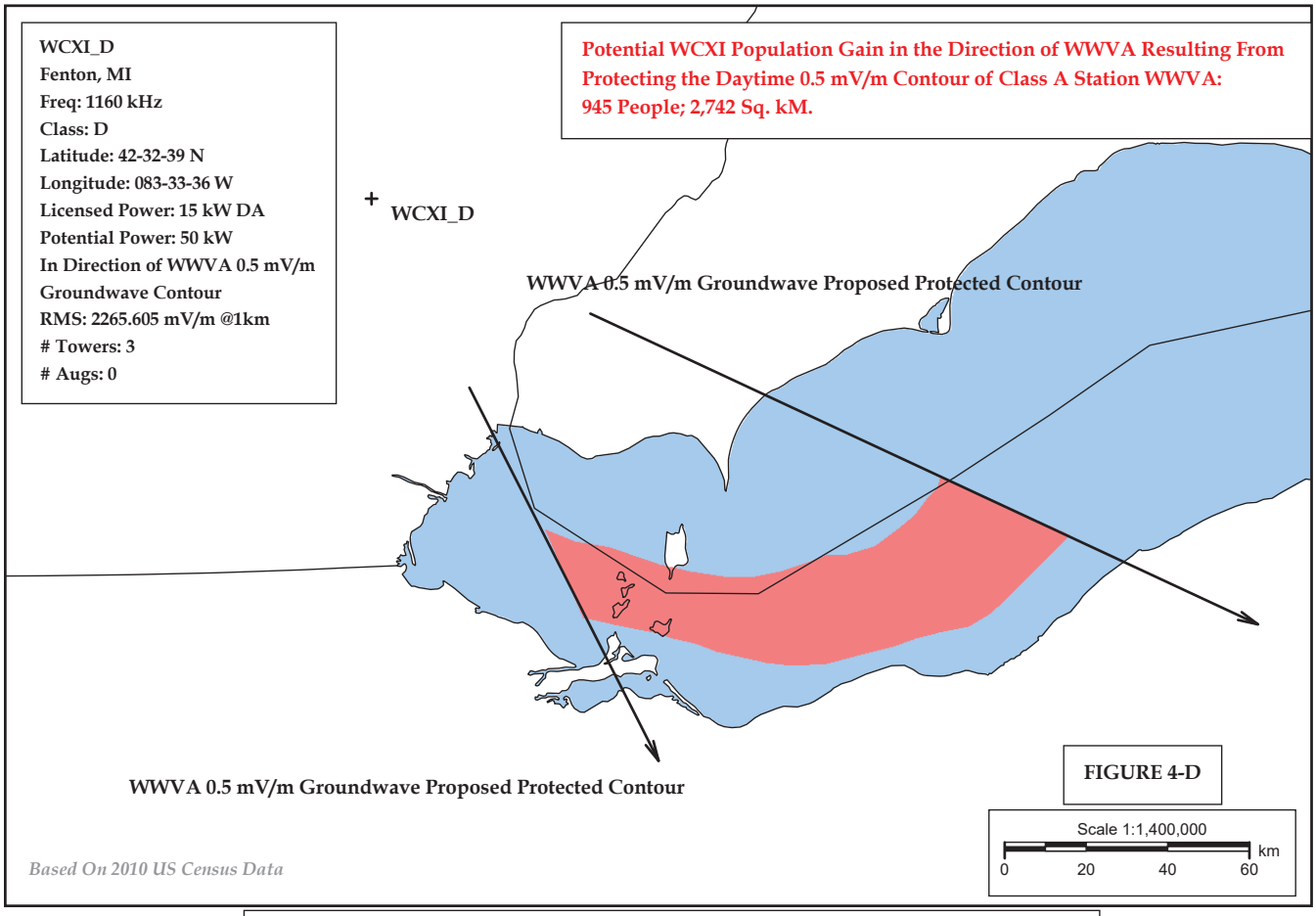
Red Shaded Area is Predicted Daytime Interference Area Within WWVA's 0.1 mV/m Contour From Nearby Class D Stations WCXI, WDFB and WCXN Operating With Maximum Power in Direction of WWVA



Potential WDFB 0.5 mV/m Gain Area In the Direction of WWVA Resulting From Class A Station WWVA Being Protected to Its 0.5 mV/m Groundwave Daytime Contour



Potential WCXN 0.5 mV/m Gain Area In the Direction of WWVA Resulting From Class A Station WWVA Being Protected to Its 0.5 mV/m Groundwave Daytime Contour



Potential WCXI 0.5 mV/m Gain Area In the Direction of WWVA Resulting From Class A Station WWVA Being Protected to Its 0.5 mV/m Groundwave Daytime Contour

WWVA, WHEELING, WEST VIRGINIA
1170 kHz 50 kW DA-N
JANUARY 2019

WWVA NIGHTTIME OPERATION

0.5 mV/m 50% Skywave (Presently Protected Contour) Current Population	Interference Caused to 0.5 mV/m 50% Skywave by Maximized Class D Nighttime Operations Per *SFNPRM* Nighttime Alternative 1 (Figure 1-N)	
	Population:	Percentage of Interference to Population Within 0.5 mV/m 50% Skywave:
80,227,067	65,713,349	82%

GAIN IN CLASS D STATION'S NIGHTTIME INTERFERENCE FREE CONTOUR SERVICE WITH MAXIMUM POWER IN THE DIRECTION OF WWVA (Figures 2-N through 11-N)

Maximizing Class D Station	Gain by Population (Persons) and Area (square kilometers)	Figure
WDFB	5,809/119	2-N
WWLE	0/0.6	3-N
WWTR	51/0.3	4-N
WCTF	67/0.7	5-N
WCXN	100/1.5	6-N
WCLN	61/0.8	7-N
WQHC	6,633/82.5	8-N
WDEK	3,461/5.2	9-N
WFDL	12,625/73.5	10-N
WFPB	2,558/15.2	11-N
COLLECTIVE GAIN:	31,365/299.3	

NET LOSS IN SERVICE FROM *SFNPRM* NIGHTTIME ALTERNATIVE 1 (CLASS A AM STATION LOSS MINUS COLLECTIVE GAIN IN CLASS D SERVICE):

65,713,349 (Loss of Class A AM Service) – 31,365 (Collective Class D Gain) = 65,681,984 persons Net Loss

WWVA, WHEELING, WEST VIRGINIA
1170 kHz 50 kW DA-N
JANUARY 2019

WWVA CRITICAL HOURS OPERATION

***SFNPRM* Alternative 1: No Critical Hours Protections To Class A AM Stations**

Critical Hours Time Period	Interference Caused Within Class A 0.1 mV/m Groundwave Contour By Class D Operations With Full Daytime Power			Interference Caused Within Class A 0.5 mV/m Groundwave Contour By Class D Operations With Full Daytime Power		
	Population:	Area (square kilometers):	Percentage of Interference to Population Within 0.1 mV/m Groundwave Contour:	Population:	Area (square kilometers):	Percentage of Interference to Population Within 0.5 mV/m Groundwave Contour:
One Hour Before Sunset (Figure 1.1-C)	0	0	0%	0	0	0%
One-Half Hour Before Sunset (Figure 1.2-C)	3,873,628	78,446	33.8%	0	0	0%
One-Quarter Hour Before Sunset (Figure 1.3-C)	7,730,489	108,618	67.4%	961,919	10,128	20.5%

WWVA CRITICAL HOURS OPERATION

***SFNPRM* Alternative 2: Section 73.190 Critical Hours Figures Revised to Reference Distance From 0.5 mV/m Contour (in Lieu of 0.1 mV/m Contour) of Class A AM Stations**

Critical Hours Time Period	Interference Caused Within Class A 0.1 mV/m Groundwave Contour By Class D Operations Per Alternative 2			Interference Caused Within Class A 0.5 mV/m Groundwave Contour By Class D Operations Per Alternative 2		
	Population:	Area (square kilometers):	Percentage of Interference to Population Within 0.1 mV/m Groundwave Contour:	Population:	Area (square kilometers):	Percentage of Interference to Population Within 0.5 mV/m Groundwave Contour:
One Hour Before Sunset (Figure 2.1-C)	0	0	0%	0	0	0%
One-Half Hour Before Sunset (Figure 2.2-C)	3,315,175	69,448	28.9%	0	0	0%
One-Quarter Hour Before Sunset (Figure2.3-C)	6,931,561	101,876	60.4%	310,049	4,423	6.6%

WWVA, WHEELING, WEST VIRGINIA
1170 kHz 50 kW DA-N
JANUARY 2019

WWVA DAYTIME OPERATION

0.1 mV/m Groundwave (Presently Protected Contour)	Interference Caused to Class A 0.1 mV/m Groundwave Contour By Maximized Class D Daytime Operations Per *SFNPRM* Daytime Proposal (Figure 1-D)	
Population:	**Population:**	**Percentage of Interference to Population Within 0.1 mV/m Groundwave Contour:**
11,470,918	**4,755,867**	**41.8%**

GAIN IN CLASS D STATION'S DAYTIME OPERATION IN THE DIRECTION OF WWVA WITH MAXIMUM POWER IN THE DIRECTION OF WWVA (Figures 2-D through 4-D)

Maximizing Class D Station	Gain by Population (Persons) and Area (square kilometers)	Figure
WDFB	**218,320/2,682**	**2-D**
WCXN	**26,566/934**	**3-D**
WCXI	**945/2,742**	**4-D**
COLLECTIVE GAIN:	**245,831/6,358**	

NET LOSS IN SERVICE FROM *SFNPRM* DAYTIME PROPOSAL (CLASS A AM STATION LOSS MINUS COLLECTIVE GAIN IN CLASS D SERVICE):

4,755,867(Loss of Class A AM Service) – 245,831 (Collective Class D Gain) = 4,510,036 persons Net Loss[1]

[1] This figure represents the net loss assuming upgrades by the listed neighboring Class D stations. Potentially different populations within the studied Class A AM station could be subject to interference depending upon future neighboring upgrades, with up to 6,768,570 persons subject to loss of service (WWVA's 0.1 mV/m daytime contour population of 11,470,918 minus WWVA's 0.5 mV/m daytime contour population of 4,702,348 = 6,768,570).

Grid Based Incoming Interference Population Report

Station Information:

Call: WWVA
Freq: 1170 kHz
WHEELING, WV, US
Hours: N
Lat: 40-06-07 N
Lng: 080-52-02 W
Power: 50.0 kW - Custom Q Value Used: 70.71
Theo RMS: 2574.95 mV/m @ 1km @ 50.0 kW
# of Augmentations: 12

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	0.500	96.0	0.0	0.0	171.3	0	0	0.0	0.0	0.0	0.0
2	1.000	0.0	90.0	77.0	171.3	0	0	0.0	0.0	0.0	0.0
3	0.500	-96.0	90.0	77.0	171.3	1	0	0.0	0.0	0.0	0.0

#	Azimuth (deg)	Radiation (mV/m@1km)	Span (deg)
1	171.00	1770.28	25.0
2	210.00	249.45	20.0
3	220.00	112.65	20.0
4	225.00	128.75	10.0
5	235.00	72.42	20.0
6	257.00	83.69	44.0
7	257.00	144.84	10.0
8	270.00	78.86	18.0
9	279.00	80.47	20.0
10	290.00	120.70	20.0
11	300.00	201.17	20.0
12	310.00	337.96	20.0

Theoretical RMS: 2574.95 mV/m@1km Erss = 2532.98 mV/m@1km
Standard RMS: 2704.72 mV/m@1km Q = 70.71 mV/m@1km
Augmented RMS: 2706.58 mV/m@1km

Study Information:

Calculation Area: SkyWave 500.0 uV/m
Grid Size: 500 x 500
Reference Propagation Model: Groundwave + Skywave
Interference Propagation Model: Groundwave + Skywave
Ratios:
Co-channel: 20.0
First Adjacent: 2.0
Second Adjacent: 0.033

Third Adjacent: 0.033
Ix signals combined using RSS methodology: Yes
RSS Cutoff Percentage: 50.0
Threshold for reception: 0.5 mV/m
Population Database: 2010 US Census (PL)

Summary:

Total Station Coverage:	80,227,067	(1637085.8 sq. km)
Total Interference:	65,713,349	(1369946.0 sq. km)
Interference Free Coverage:	14,513,718	(267153.8 sq. km)

Stations Causing Interference:

Call Letters	Area (sq. km)	Housing Units	Population
WFPB_N	1,117,029	23,446,246	55,136,352
WCTF_N	154,237	14,484,573	35,017,635
WWLE_N	387,265	5,849,760	12,722,576
WCLN_N	320,118	4,891,346	10,778,229
WWTR_N	74,728	4,275,198	10,343,599
WDEK_N	203,623	3,973,545	8,652,993
WDFB_N	91,032	2,342,138	5,229,098
WFDL_N	97,676	999,721	2,131,771
WQHC_N	2,869	421,956	870,667
WCXN_N	33,770	385,946	819,577
KJXX_N	(Not Considered In Report)		
KJXX	(Not Considered In Report)		

Interference Free Breakdown:

White:	10,403,444	[71.7%]
Black:	2,002,165	[13.8%]
Hispanic:	1,065,536	[7.3%]
Native American:	34,577	[0.2%]
Asian:	697,472	[4.8%]
Pacific Islander:	5,163	[0.0%]
Mixed Race:	279,840	[1.9%]
Other:	25,521	[0.2%]
Total:	14,513,718	

	Housing Units	Population	%
Connecticut			
Fairfield County			

Grid Based Incoming Interference Population Report

Station Information:

Call: WWVA
Freq: 1170 kHz
WHEELING, WV, US
Hours: D
Lat: 40-06-07 N
Lng: 080-52-02 W
Power: 50.0 kW
Theo RMS: 370.15 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	171.3	0	0	0.0	0.0	0.0	0.0

Study Information:

Calculation Area: GW 0.1 mV/m
Grid Size: 500 x 500
Reference Propagation Model: Groundwave
Interference Propagation Model: Groundwave
Ratios:
Co-channel: 20.0
First Adjacent: 2.0
Second Adjacent: 0.033
Third Adjacent: 0.033
Ix signals combined using RSS methodology: Yes
RSS Cutoff Percentage: 50.0
Threshold for reception: 0.1 mV/m
Population Database: 2010 US Census (PL)

Summary:

Total Station Coverage: 11,470,918 (141136.5 sq. km)
Total Interference: 4,796,299 (52853.8 sq. km)

Interference Free Coverage: 6,674,619 (88278.3 sq. km)

Stations Causing Interference:

Call Letters	Area (sq. km)	Housing Units	Population
WCXI_CP_D	30,774	1,278,303	2,771,937
WDFB_D	25,154	943,409	2,181,462
WCXN_D	5,287	27,218	55,368
WCLN_D	(Not Considered In Report)		

Interference Free Breakdown:

White:	5,966,085	[89.4%]
Black:	429,595	[6.4%]
Hispanic:	90,680	[1.4%]
Native American:	9,533	[0.1%]
Asian:	73,889	[1.1%]
Pacific Islander:	1,329	[0.0%]
Mixed Race:	96,803	[1.5%]
Other:	6,705	[0.1%]
Total:	6,674,619	

	Housing Units	Population	%
Maryland			
Allegany County			
Total	33,311	75,087	
WWVA Coverage	32,336	73,551	
White:		64,709	[88.0%]
Black:		5,940	[8.1%]
Hispanic:		1,073	[1.5%]
Native American:		85	[0.1%]
Asian:		564	[0.8%]
Pacific Islander:		26	[0.0%]
Mixed Race:		1,095	[1.5%]
Other:		59	[0.1%]
Ix Free Cov	32,336	73,551	100.00
White:		64,709	[88.0%]
Black:		5,940	[8.1%]
Hispanic:		1,073	[1.5%]
Native American:		85	[0.1%]
Asian:		564	[0.8%]
Pacific Islander:		26	[0.0%]
Mixed Race:		1,095	[1.5%]
Other:		59	[0.1%]
Garrett County			
Total	18,854	30,097	
WWVA Coverage	18,854	30,097	
White:		29,278	[97.3%]
Black:		299	[1.0%]
Hispanic:		220	[0.7%]
Native American:		37	[0.1%]
Asian:		76	[0.3%]
Pacific Islander:		0	[0.0%]